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11th Year of Publication

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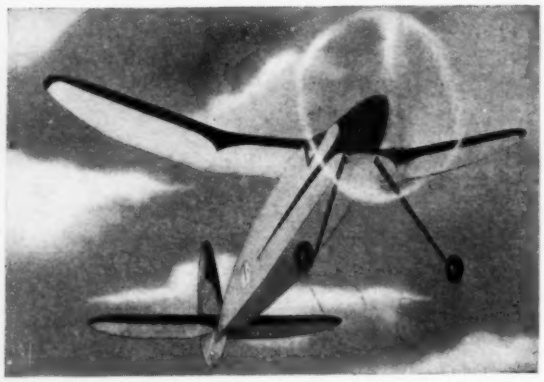

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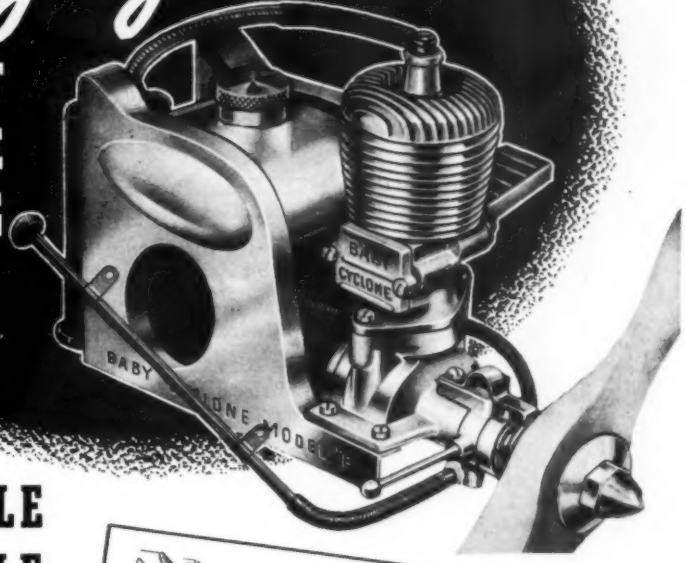

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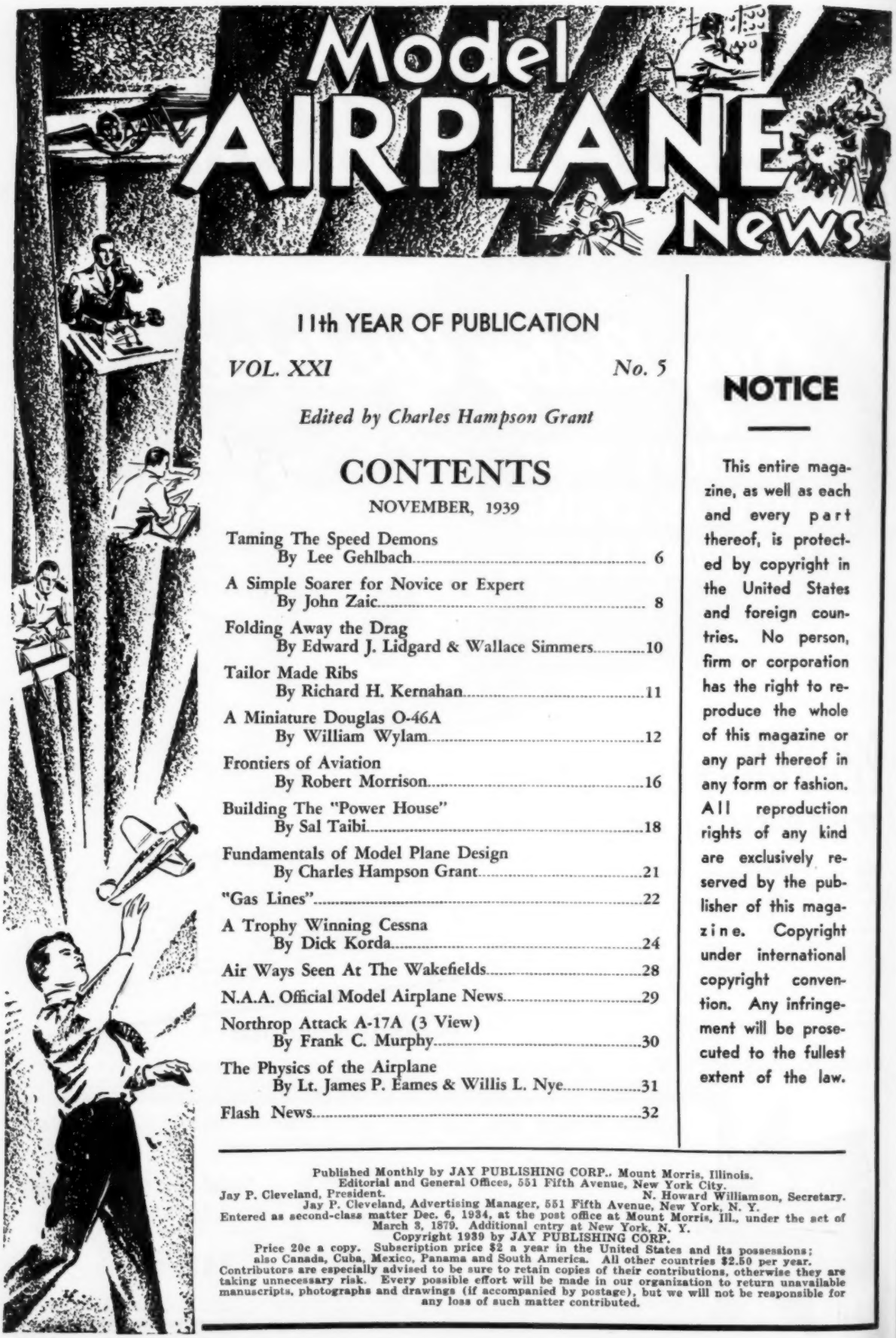

11th YEAR OF PUBLICATION

VOL. XXI *No. 5*

Edited by Charles Hampson Grant

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Published Monthly by JAY PUBLISHING CORP., Mount Morris, Illinois.
Editorial and General Offices, 551 Fifth Avenue, New York City.
Jay P. Cleveland, President. N. Howard Williamson, Secretary.
Jay P. Cleveland, Advertising Manager, 551 Fifth Avenue, New York, N. Y.
Entered as second-class matter Dec. 6, 1934, at the post office at Mount Morris, Ill., under the act of March 3, 1879. Additional entry at New York, N. Y.
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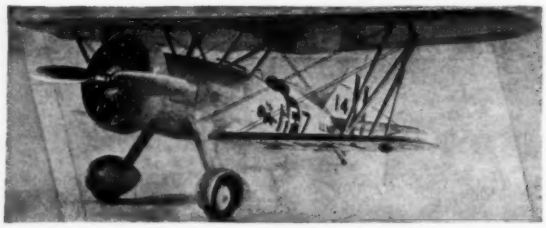

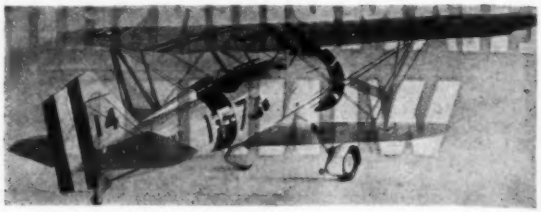

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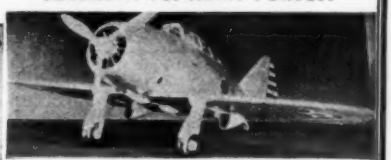

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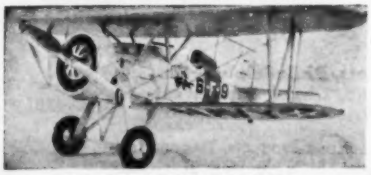

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The racer which Art Chester piloted to victory in the 1939 Greve Trophy race. (Morrison)

TAMING THE SPEED DEMONS

By LEE GEHLBACH

THERE is always a new crop of racing airplanes and pilots ready to replace the ones that drop out of the game for one reason or another. Since year in and year out, there is much more spent by the participants in the racing game than is ever paid back to them in prize money, it is not the purpose of this article to recommend such an unprofitable procedure. However, for those who still feel the urge to fly to so-called fame and glory or want to better understand the spectacle from the grandstands, here are some of the inside pointers.

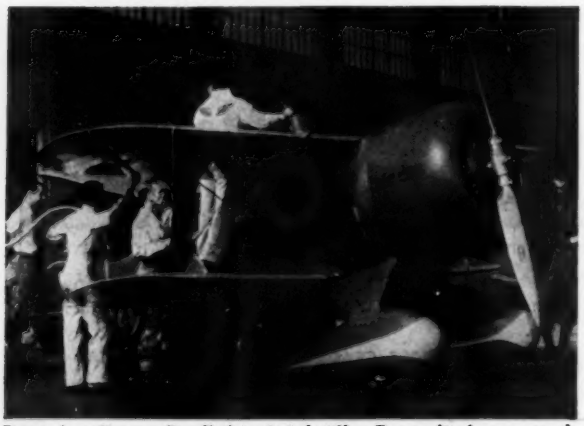
Any new design should be aimed specifically at certain races or classes of races. Just before starting a new racer, the National Aeronautical Association, Washington, D. C., should be consulted regarding the races which are at that time scheduled and the rules and regulations which will apply. The builder should give particular heed to the rules so that at the last minute he need not suffer the keen disappointment of being left at the post because of his own failure to comply.

The Civil Aeronautics Authority requires that all racers meet their specifications and be licensed as experimental airplanes. The pilot needs a private license and a National Aeronautical Association racing license. Besides that, he is not supposed to be allowed to race anything that is too much for his experience and ability.

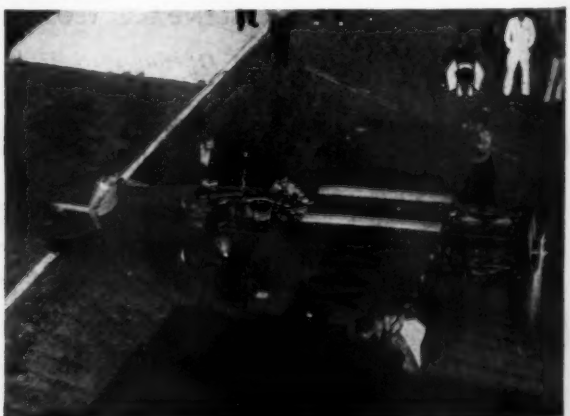
Airplane design starts right from the propeller and a lot of peculiar things happen here. Propeller tip speeds must be kept well below the speed of sound which is approximately 1100 feet per second or 825 m.p.h. Otherwise they would only consume more engine horsepower and actually contribute less forward thrust to the airplane. Reduction gear drive is desirable for increased propeller efficiency but must not be too great since the extra torque reaction must be absorbed by very small wings. The Italian's idea of two propellers together but turning in opposite directions is perfect but so far has not been used in an American racer because of the expense.

For greatest efficiency the propeller should not be too close to the engine and the further it can be kept from the wings,

Russell Boardman and the Gee Bee racer in which he was killed



Preparing Jimmy Doolittle's Laird "Sky Buzzard" for a speed dash. It flew from Los Angeles to New York in 11 hrs. 15 min.



They say a barn door will fly if sufficient power is available. Apparently Rus Hosler took this seriously when he built this plane

The racer of sleek lines designed by Clayton Folkerts. It was entered in the Thompson Trophy race. It has a span of only 16 feet and weighs less than 1600 pounds. Powered with a 400 hp. Menasco engine it speeds along at 360 m.p.h. Its features, such as a streamline fuselage, cantilever wings and retractable landing gear, reduce its head resistance to a minimum

Knotty Problems of Design That Confront the Racing Pilot and How They May Be Solved to Increase the Efficiency and Safety of Racing Planes

landing gear or anything else, the better. Controllable pitch propellers always help and in the high powered jobs are practically a necessity. An airfoil blade section instead of a round shank should be carried as close to the hub as required blade strength will permit. There are some new propellers with the blades off-set to either side of the hub which are quite an improvement in this respect.

Directly behind the hub the airflow is forward, then out along the blades, so there is little if any loss in having an engine which is one-third of the propeller diameter. An engine nacelle should be as nearly as possible concentric behind the propeller hub. For these reasons the radial engines, particularly the big twin rows, lend themselves to better streamlining than most people have believed. The trick to it is in the cowlings and here the engineer has an unlimited opportunity to exercise his ingenuity.

With air-cooled cylinders tight baffle plates should be used to force the air between the cooling fins on the cylinders. Any extra air that passes through open spaces between cylinders serves only to slow down the airplane and reduces cooling. The outside openings for inlet air to and outlet air from the cylinders should be held to a minimum which will provide cooling in level flight. For cooling in taxiing, climbing or emergencies, trapdoors controllable from the cockpit should be provided on the outlet air side for additional forced draft past the cylinders. With radial engines it has been positively demonstrated that the best fuselage or nacelle diameter is the same as the engine diameter, but deviation from this within small limits is unimportant.

There are always so many races that are open only to engines of limited size based on piston displacement. Except for the expense, it would be a "cinch bet" to build special fluid-cooled engines with a large number of small cylinders and rotating at very high revolutions per minute. They should have more than twice the horsepower as the converted commercial engines now almost invariably used.

A good way to build a 550 cubic inch engine would be to take a stock twelve-cylinder geared Ranger (the present commercial engine is 772 cubic inches displacement), and substitute fluid-cooled cylinder blocks of smaller bore and a crankshaft with shorter stroke. For racing purposes this should develop over 500 hp. as compared to 250 hp., which is the commercial rating of the present big six-cylinder Menasco of that displacement.

Extra power is obtained from a given engine by increased compression ratio, changes in valve and ignition timing, reboring cylinders for greater displacement, higher supercharging and higher revolutions per minute. Then it is a gamble whether the engine will last out the race or start pitching its connecting rods right out through the side of the crankcase. This always spectacular event is most likely to happen to the leading airplane in the last one or two laps of the race.

The famous racing pilot, Lee Gehlbach, in the cockpit of his latest racer

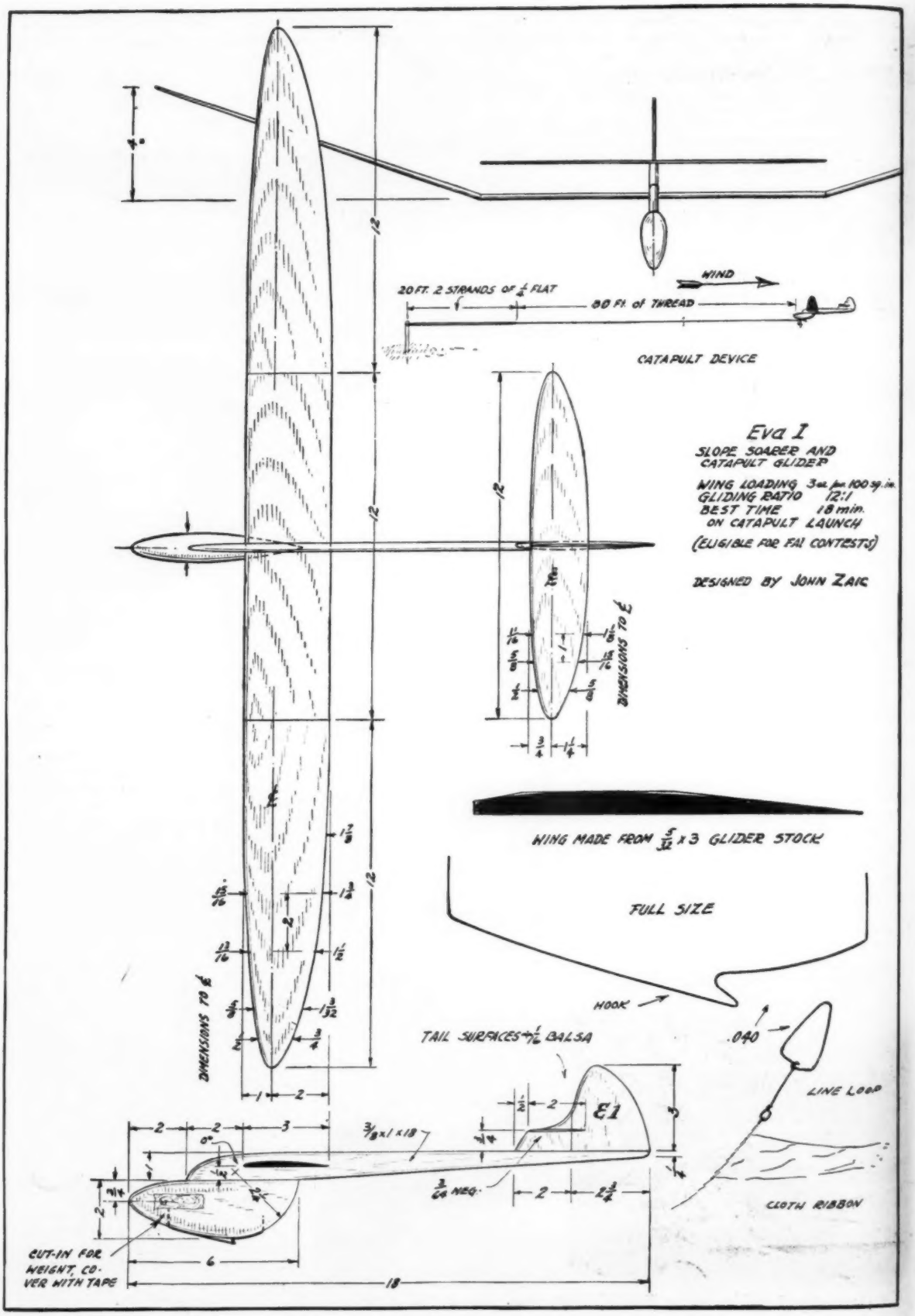
These highly pepped-up engines need special fuels and many combinations of alcohol, benzol and various anti-knock compounds have been used. The best bet at the present time appears to be the newly-developed isoctane or 100 octane gasolines. Then the engines and carburetors must be adjusted and tuned for that fuel. Some of the boys have done all that and then forgotten to have a supply of their special mixture on hand for the race.

There has been a lot of grief with fuel and oil lines and it is best to make them well oversized. Extreme care should be taken in the installation to avoid fatigue cracks under vibration. All hose connections should be of a synthetic rubber which is not affected by oil or gasoline. To avoid smearing windshields in flight, cowlings, oil systems and crankcase breathers should be so arranged that any loose oil will go back along the bottom and not over the top of the fuselage. The oil must be cooled so the only answer is to install an oil radiator of ample size and blast plenty of air through it.

Exhaust manifolds should be made of stainless steel because ordinary steel will corrode and fall apart in a very short while. The arrangement should be such that exhaust fumes cannot possibly get into the cockpit. Unless one of the new non-icing carburetors is used, provision should be

(Continued on page 56)

Lee Gehlbach and his famous Wedell-William racer. It won many races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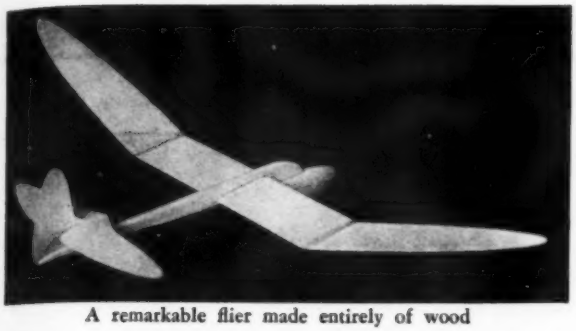
3/8 x 1 x 18
3/64 NEG.
CUT-IN FOR WEIGHT, COVER WITH TAPE
18



A remarkable flier made entirely of wood

The construction entails only simple operations

A SIMPLE SOARER FOR NOVICE OR EXPERT

A High Performance Soaring Plane That A Beginner May Construct Easily and Quickly

By JOHN ZAIC

A GOOD guess would be that about ninety per cent of all models made in America are powered and another good guess would be that ninety per cent of models made in Europe are gliders. One possible reason may be that, in America, model building is first a hobby or sport and a powered model is preferred by the experimental groups because of its greater appeal to creative ability, due to its more numerous problems. However, Europe model building is a bit more serious, ultimate aim being to make an efficient air force. Model gliders are a short step to real gliding and soaring—which is another short step to real plane flying.

The results of the Jugoslavian King Peters International Model-Glider Competition in England was very interesting. Offhand, Germany, having the greatest experience in this branch of model work, had the best chance of winning a leg on the trophy but the English, centering around Mr. Bullock, were considered very dangerous. The way they cleaned up the first King Peter's meet was shocking: the other contestants, including the author, did not even get "crumbs to lick." Excuse me, we did get something. We were promised, or bribed if you will, by the English team if they won they would pay for all the cakes and ice cream we could eat. Naturally when we came to collect the reward, we put much painstaking research into the serious business of finding out the most expensive place in town and then ate until they got to worrying. But the laugh was on me, for that night the banquet was held and we just did not have the courage to order second helpings except, of course, the champagne and dessert. Next time our timing will be better. The King Trophy is given to the nation whose team will be able to win it three times. Unlike the Wakefield Competition, it cannot be won by an individual. An interesting sidelight or feature is that one year the contest is held for rubber-powered models and the next for glider models.

"Eva" was originally designed as a hill soarer but has proven to be a fair all-around performer. It has, or its loaned design, won every contest entered into. Its best flight has been eighteen minutes. We have tried different wing combinations but the present one seems most practical. Increasing the span will better the glide but there is danger of wing flutter and spins on the catapult launch.

One side purpose of this article is to introduce the European method of launching gliders, called the "hochstart." This was originated by Horst Winkler, Germany, and their contest rules for purpose of coming competitions. The "hochstart" may soon put the glider in an endurance class equal to the powered model for it launches them to high altitudes. Contest rules are now those of the F.A.I. and specify fuselage cross section of $\frac{L^2}{200}$, weight rule 15 grams per square decimeter, or about three ounces per 100 square inches wing area, and maximum of one-third the wing area for the stabilizer area.

When we heard of the hochstart in Europe we decided to try it out on this glider. Results were very satisfactory one way, but not the other: Every flight was over 1500 feet in length. That became annoying after the third flight but some little boys soon came to the rescue and they did the chasing.

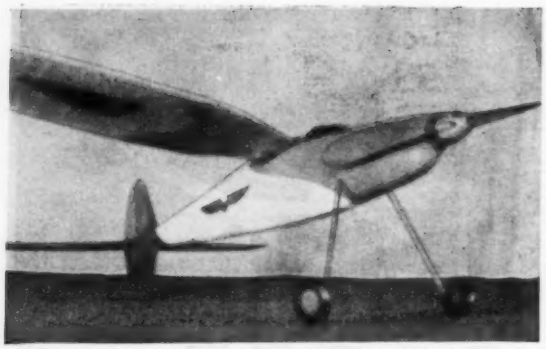
The hochstart is simple. The catapult consists of rubber and string. A post is fixed into the ground then a twenty foot length of rubber (we used two strands of one-quarter flat rubber) is tied to it. To the other end of rubber an eighty foot length of string is tied, a simple wire fitting being used to attach the string to the model. The flyer walks a few steps backward and releases the model which climbs in a arc. When it reaches its maximum height it goes into a level position, the string falls off and the model goes off on a thermal hunt. The altitude obtained is about the same as the length of rubber and string. The official length of catapult length is seventy-five feet of rubber and two hundred twenty-five feet of string, so it is not so surprising that gliders may become real endurance models and powered models may have a surprise coming some day.

One mistake every beginner makes is using too much rubber tension and as a result the model will not be in a nice nose-down position when the string unhooks but instead will do some fancy stunt flying in the way of loops and rolls and also waste some material in the glue can.

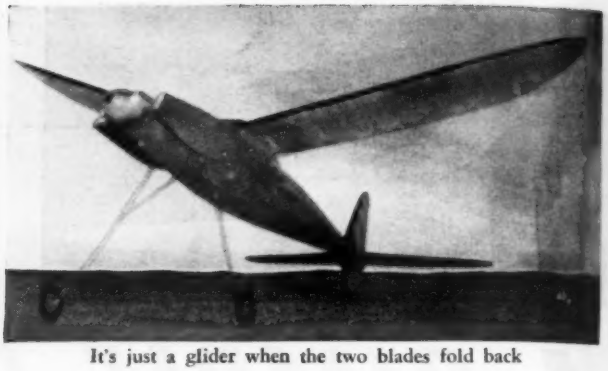
Another point is to do your first flying when there is no wind, evening time is usually good, so that the flying faults may be more easily seen and ironed out. Later, when enough experience is obtained, increased rubber tension and wing and tail warping similar to hand-launched gliders can be done. We were able to get twice the altitude a hochstart is supposed to give doing this, but it is tricky and it will be

(Continued on page 63)

The author demonstrates how the soarer may be launched by means of a catapult



Practically no drag when its single blade is folded



It's just a glider when the two blades fold back

Folding Away The Drag

How Head Resistance May Be Reduced and Duration Increased by Means of Folding Propellers

By EDWARD J. LIDGARD and WALLACE SIMMERS

FOR A LONG period of time the free wheeling propeller dominated the field as it was the first step in cutting down the drag of the propeller after the rubber motor had unwound. True! It did flash in the sun and enable the observer to keep the model in sight longer, but it was evident that the percentage of drag of the whole ship was largely due to the propeller. Then a few model builders began to realize the efficiency they were losing due to their large propellers.

About this time Marvin Setzke and Carl Goldberg thought of and developed the "feathering propeller." Here was the second improvement in cutting down propeller drag. The propeller blades instead of revolving freely in the airstream were now made to change their pitch after the power gave out, so that they met the airstream at a minimum angle of attack. This was accomplished by imbedding a wire and tubing hinge in the leading edge of the propeller. A spring forced the blade out against a catch after the power gave out. A marked decrease in drag resulted from the use of this system and many model builders used it to advantage over the free wheeler. However, it had many disadvantages which prohibited its general use. Construction difficulties were a great stumbling block, for due to the principal of the feathering propeller light, thin blades were necessary. However light, thin propeller blades are far from strong. They flair under high power, get nicked badly and break upon the impact of a bad landing. Then again the stops, delicate springs and catches necessary never seem to work properly or "stay put" under contest stress.

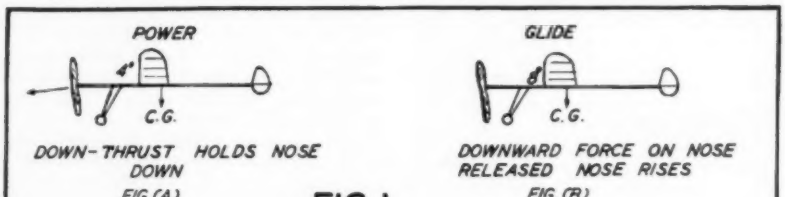


FIG. 1.

FREEWHEELING OR FEATHERING PROPELLER

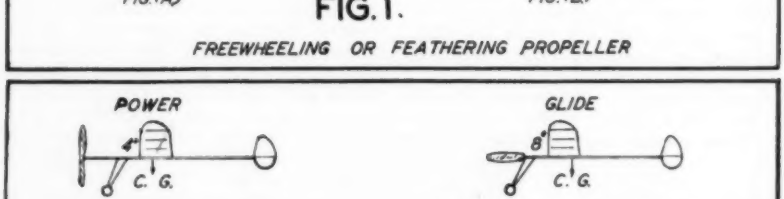


FIG. 2.

FOLDING PROPELLER

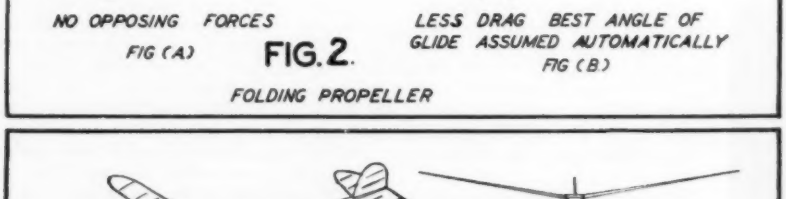
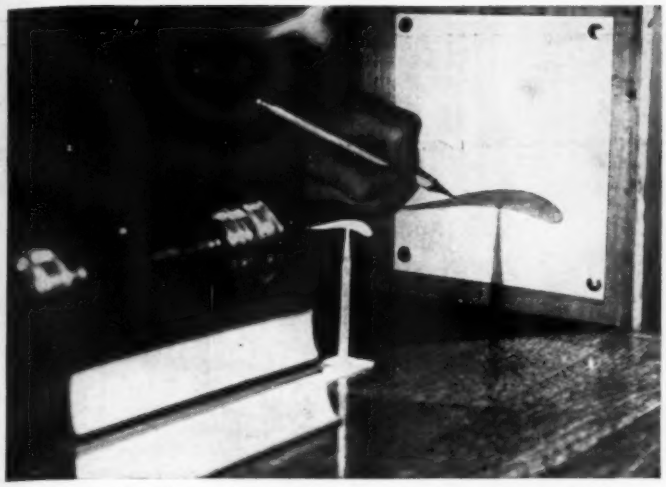


FIG. 4

In 1937 we saw the acceptance of a new and highly practical solution to the propeller problem, the third and best method yet devised. The folding propeller had come to light! If the drag of the propeller could be cut down by making it assume a lower angle of attack and consequently have less frontal area, how much better it would be to have the blades meet the airstream from an end view. All that would be necessary would be a hinge placed on the rear face of each propeller blade so that the blades could fold back along the fuselage. Here was a system superior to all former methods, with numerous other well-founded and proved advantages.

First of all the decrease in drag is remarkable. This can readily be proven by a simple test. Stretch a wire which passes through the hubs of the propellers to be tested vertically from the floor. Now allow a free wheeling propeller, a feathering propeller and a folding propeller to drop to the floor guided by the wire. If the wire is long enough a stop-watch may be employed for positive proof. The free wheeling propeller will spin down rather slowly, the feathering propeller will drop straight down, but noticeably slower, and the folding propeller will drop like a plummet. This test may be supplemented by actual flight tests or critical observance at any future contests where all types of propellers are used.

On many occasions observers have watched a model equipped with a folding propeller perform in the following manner: As the last few turns left in the motor become exhausted the model stops climbing and levels off, at this point the propeller is turning over with no thrust being developed. However it continues to rotate (free wheel) for a moment then



An outline of any size may be drawn by the shadow method

Cutting out the ribs for a tapered wing

TAILOR MADE RIBS

Your Greatest Problem Is Solved Here—Now You Can Easily Make Ribs of Any Size

By **RICHARD H. KERNAHAN**

THERE is no question about whether or not we want tapered elliptical wings on our models: Most of us most certainly do want them. We know they make our models look better and we know from the design of their "big brothers" that they are more efficient. The question is how to make them without burning midnight oil for weeks while plotting each individual rib. Some of us dodge this extended labor by plotting one or two ribs and roughly sketching the remainder. Others just build a squared-off wing and let it go at that.

However, if we follow either of these methods, we know we have broken the rules of our conscience at least. Our model may look well and fly well, but if we aren't absolutely certain that each rib is exactly proportioned to the chosen airfoil we carry a guilty knowledge that we could have done better.

We all begin by building simple structures with untapered wings and usually end just about the time we are ready to graduate into the class which builds the ultra-streamlined model airplanes of today. The author went through all this, and when confronted with the tapered elliptical wing was on the point of giving up. In fact, he did until he devised two simple methods for obtaining accurately cut ribs by one plotting of the airfoil.

The first method, and the most accurate, is for those who have a camera and enlarger or some sort of projection device. Having chosen your airfoil, plot it quite large; that is, with about a three-foot chord. This will give you ample size to make an accurate drawing. Black in a notch for the leading edge, also a small portion of the rear tip for the trailing edge. Do not, unless you are certain of what you are doing, draw in notches for spars. The positions of these will have to be marked later and depend upon the design of the wing. Curved spars are not very satisfactory, and would result if you showed the notches on your drawing. If your drawing is in pencil, it is best to go over it with India ink.

Set the drawing where it is well-lighted

(Continued on page 62)

suddenly the blades fold back along the sides of the fuselage. As soon as the blades fold back a very noticeable flattening of the gliding angle may be observed, over the angle previously assumed while the blades were revolving freely in the airstream. This is due to the sudden decrease in drag, which in turn instantly increases the L/D of the ship and makes the glide better. There is also another reason for this fine set-up of climb and glide adjustment which we shall discuss in detail.

The goal of every model builder is to have his models as simple and fool-proof to adjust as possible. Here again the folding propeller proves itself of value because of the fact that when it folds it shifts the C.G. slightly backwards. By the use of Figures 1 and 2 we shall attempt to prove the value of this movement. It is a well accepted fact that a model flies most efficiently under power at an angle

(Continued on page 59)

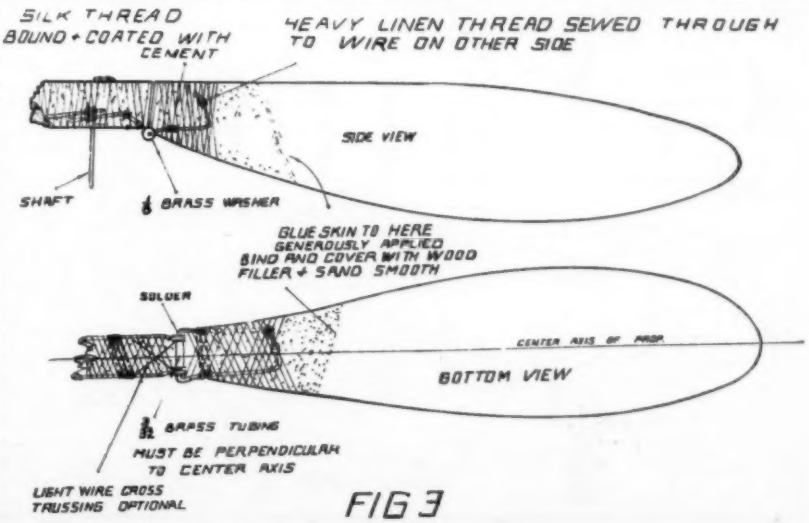

SILK THREAD
BOUND + COATED WITH CEMENT
HEAVY LINEN THREAD SEWED THROUGH TO WIRE ON OTHER SIDE
SIDE VIEW
SHAFT
BRASS WASHER
GLUE SKIN TO HERE GENEROUSLY APPLIED
BIND AND COVER WITH WOOD FILLER + SAND SMOOTH
SOLDER
CENTER AXIS OF PROP.
BOTTOM VIEW
BRASS TUBING
MUST BE PERPENDICULAR TO CENTER AXIS
LIGHT WIRE CROSS TRUSSING OPTIONAL

FIG 3

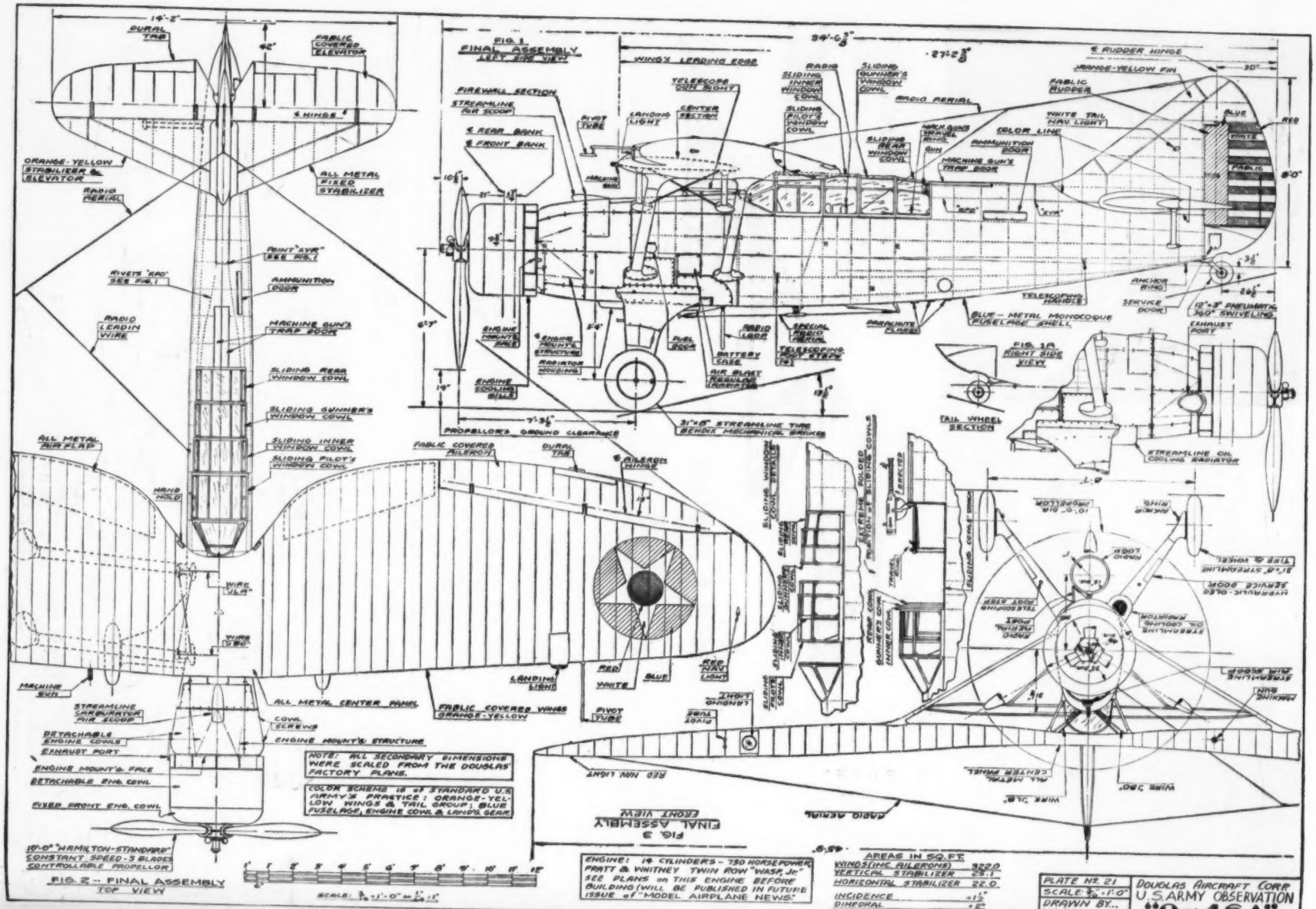


FIG. 1
FINAL ASSEMBLY
LEFT SIDE VIEW
FIG. 2 - FINAL ASSEMBLY
TOP VIEW
FIG. 3
FINAL ASSEMBLY
FRONT VIEW
FIG. 4
RIGHT SIDE VIEW
DURAL TAB
FABRIC COVERED ELEVATOR
4 HINGES
ORANGE-YELLOW STABILIZER & ELEVATOR
ALL METAL FIXED STABILIZER
RADIO AERIAL
PAINT "EVR" SEE PLT. 1
RIVETS "RAD" SEE FIG. 1
AMMUNITION DOOR
RADIO LEADIN WIRE
MACHINE GUN'S TRAP DOOR
SLIDING REAR WINDOW COWL
SLIDING GUNNER'S WINDOW COWL
SLIDING INNER WINDOW COWL
SLIDING PILOT'S WINDOW COWL
ALL METAL AIR FLAP
HAND HOLD
WIRE
MACHINE GUN
STREAMLINE CARBURETOR AIR SCOOP
DETACHABLE ENGINE COWLS
EXHAUST PORT
ENGINE MOUNT'S FACE
DETACHABLE ENG. COWL
FIXED FRONT ENG. COWL
10'-0" "HAMILTON-STANDARD" CONSTANT SPEED - 3 BLADES CONTROLLABLE PROPELLOR
ALL METAL CENTER PANEL
FABRIC COVERED WINGS ORANGE-YELLOW
LANDING LIGHT
COWL SCREWS
ENGINE MOUNT'S STRUCTURE
FABRIC COVERED AILERON
DURAL TAB
AILERON HINGE
RED
WHITE
BLUE
RED NAV. LIGHT
PIVOT TUBE
LANDING LIGHT
WING'S LEADING EDGE
TELESCOPE SITE SIGHT
FIREWALL SECTION
STREAMLINE AIR SCOOP
PIVOT TUBE
LANDING LIGHT
CENTER SECTION
4 REAR BANK
4 FRONT BANK
RADIO
SLIDING GUNNER'S WINDOW COWL
SLIDING INNER WINDOW COWL
SLIDING PILOT'S WINDOW COWL
SLIDING REAR WINDOW COWL
RADIO AERIAL
MACH. GUN'S TRAP DOOR
GUN
AMMUNITION BOOM
COLOR LINE
MACHINE GUN'S TRAP DOOR
"EVR"
"RAD"
RUDDER HINGE
ORANGE-YELLOW FIN
FABRIC RUDDER
WHITE TAIL NAV. LIGHT
BLUE
WHITE
FABRIC
RED
8'0"
ENGINE MOUNTS ARMS
4 ENGINE MOUNTS STRUCTURE
RADIATOR HOUSING
ENGINE COOLING BAFFLE
FUEL TANK
RADIO LEADS
BATTERY CASE
SPECIAL RADIO AERIAL
TELESCOPING STEP-STRIPS
AIR BLAST REGULATING SHUTTER
PARACHUTE FLARES
ANCHOR RING
SERVICE DOOR
TELESCOPING HANDRAIL
BLUE - METAL MONOCOQUE FUSELAGE SHELL
12"-3" PNEUMATIC 360° SWIVELING
EXHAUST PORT
TAIL WHEEL SECTION
STREAMLINE OIL COOLING RADIATOR
3'-6" STREAMLINE TIRE BENDIX MECHANICAL BRAKES
PROPELLOR'S GROUND CLEARANCE
SLIDING WINDOW COWL
SLIDING GUNNER'S WINDOW COWL
SLIDING INNER WINDOW COWL
SLIDING PILOT'S WINDOW COWL
SLIDING REAR WINDOW COWL
FIREWALL
FOLDER
FRONT SCREWS
LANDING LIGHT
PIVOT TUBE
RADIO AERIAL
RED NAV. LIGHT
WHITE
BLUE
ALL METAL CENTER PANEL
WIRE 3/16"
WIRE 3/32"
RADIO AERIAL
RED NAV. LIGHT
WIRE 3/16"
WIRE 3/32"
NOTE: ALL SECONDARY DIMENSIONS WERE SCALED FROM THE DOUGLAS FACTORY PLANS.
COLOR SCHEME IS OF STANDARD U.S. ARMY AIR PRACTICE: ORANGE-YELLOW WINGS & TAIL GROUP; BLUE FUSELAGE, ENGINE COWL & LAND'G. GEAR.
ENGINE: 9 CYLINDERS - 750 HORSE POWER PRATT & WHITNEY TWIN ROW "WASP Jr." SEE PLANS on THIS ENGINE BEFORE BUILDING (WILL BE PUBLISHED IN FUTURE ISSUE of "MODEL AIRPLANE NEWS."
AREAS IN SQ. FT.
WINGS (INC. AILERONS) 322.0
VERTICAL STABILIZER 25.1
HORIZONTAL STABILIZER 22.0
INCIDENCE +1½°
DIHEDRAL +2°
PLATE NO. 21
SCALE: ¾"=1'-0"
DRAWN BY... W.A.WYLAM
DOUGLAS AIRCRAFT CORP.
U.S. ARMY OBSERVATION
"O-46A"

A Miniature Douglas O-46A

How You Can Build A Scale Model of the U.S. Army's Finest Observation Plane—Complete In Every Detail

By WILLIAM WYLAM

The Douglas O-46A U.S. Army Observation Plane

THE famous "Flying Razor," nicknamed because of its odd thin fuselage, namely, the Douglas Army Observation "O-46A" is one of the army's most successful observation models. The first airplane was delivered to the army in 1936 and this airplane was considered the greatest stride made toward the perfect observation-type of airplanes. It was powered by the 750 horsepower Pratt & Whitney's "Twin Wasp Jr." The fuselage of this airplane was built in such a way that there were hardly any blind spots with the exception of a small area in the wing's center panel and the area below the floorboard. The flying characteristic of this airplane permitted the ship to fly very slowly for mapping work, without stalling, and at the same time it could roar into a high speed of 245 miles per hour at a moment's notice. This ship is unusually stable in all kinds of weather, no matter what position it is flying in or what the weather, it will always right itself unaided. The "O-46As" were sent to practically every national guard post in the country and are very popular among guardsmen.

The Model "O-46A" Observation plane is a two place, enclosed cockpit, high-wing monoplane, designed solely for observation work. The 14 cylinders, 750 horsepower, twin row "Wasp Jr." is the powerplant. The armaments consist of one .30 caliber fixed machine gun, which is located in the left wing and one .30 caliber swivel gun, which is in the rear cockpit. The landing gears are of oleo type shock absorbers with Bendix mechanical brakes. The color scheme is the standard army blue fuselage and army yellow wings and tail groups.

The fuselage is constructed of rolled aluminum alloy frames stringers on a semi-monocoque principle. All-Metal, smooth stressed skin are then riveted onto the stringers and frames. The wings are of built-up aluminum alloy ribs and beams and are fabric covered. The fixed tail surfaces are constructed of all-metal frames and stressed skin covering. Some model "O-46A's" were equipped with fabric-covered horizontal stabilizers instead of the all-metal jobs. The movable tail and aileron surfaces were of aluminum alloy frames, encased in fabric. The entire chassis is enclosed in an all-metal streamlined housing.

The airfoil that is employed is the U.S.A. 45 modified.

Some Model Building Suggestions

The main reason the "O-46A" was drawn was to give the gas modelers a suitable design for them to experiment with. Because of the "O-46A's" beautiful arrangement of the wings and tail surfaces it is very suitable for gas models. Its high parasol wings, high horizontal stabilizer and large vertical stabilizer should be very favorable for stable gas model flights and a gas model of this design should be considered by every serious gas modeler. A beautiful scale or super-detailed model can also be built from these plans. If the modeler wishes to make a gas model he must make several important changes in the entire design so that it will fly. These changes are only determined by experience and the knowledge of airfoils. Since all dimensions are shown on the plans the plans can safely be redrawn to any definite scale.

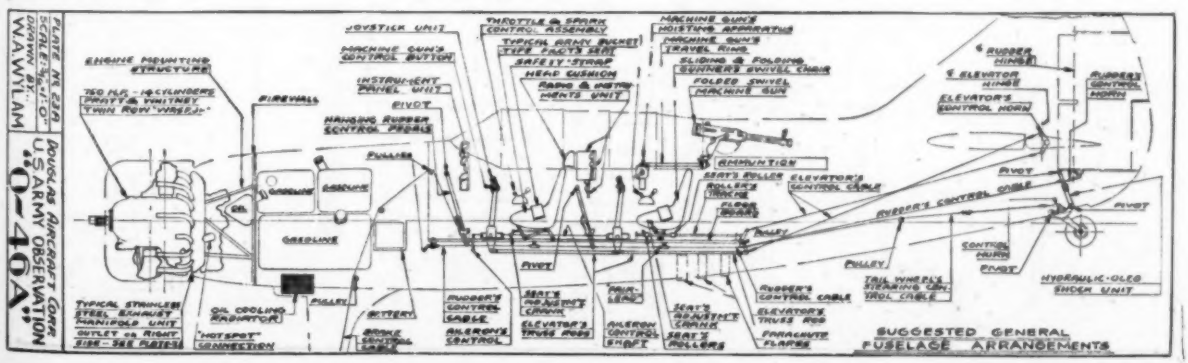
The wings should be drawn up first in its three elevations; the front, side and top view. By carefully drawing the entire lay-outs to your chosen scale, mistakes are less apt to occur. Also refer to the May 1939 issue of MODEL AIRPLANE NEWS, under the article titled "V-143 in Miniature," as you will find numerous suggestions in drawing up your plans. After the wings are all drawn begin to lay out the fuselage's side-view, then the front-view and finally the top. After the fuselage is completely drawn finish up the empennage section, then the undercarriage unit. After the plans are all drawn, the model can easily be planned out to suit the modeler's method of construction. It is suggested that the fuselage be carved out of a solid block or of two blocks screwed together; each block representing one-half of the fuselage and screwed together at the tail and nose ends. When the fuselage is completely carved the screws are removed and the hollowing-out procedure is very much easier. After the insides are all hollowed out and all roughness sanded smooth, the two halves are then glued together permanently.

The fixed tail surfaces should be made of solid wood while the movable tail surfaces should be of built-up construction. The wing's center panel should be of carved solid wood while the two outer panels should be built up in order to give your model a realistic appearance. The landing gear should be of solid construction because of its odd shape: The engine cowl can be turned down on the lathe to an exact shape and should be made thin enough so that it will fit snugly over your dummy engine. Before you start to build your engine it's best that you see the plans of the motor, which soon will be published by MODEL AIRPLANE NEWS. The insides of the fuselage should be lined with tinfoil to give a realistic metal finish. After the tin foil has dried add all the cockpit's details before you attach your sliding window cowls. The sliding window cowls should be built up of thin balsa strips and ising glass.

Brief Description of the Plans

Figs. 1, 2, 3. These three views show the final assembly or how the finished model

(Continued on page 36)



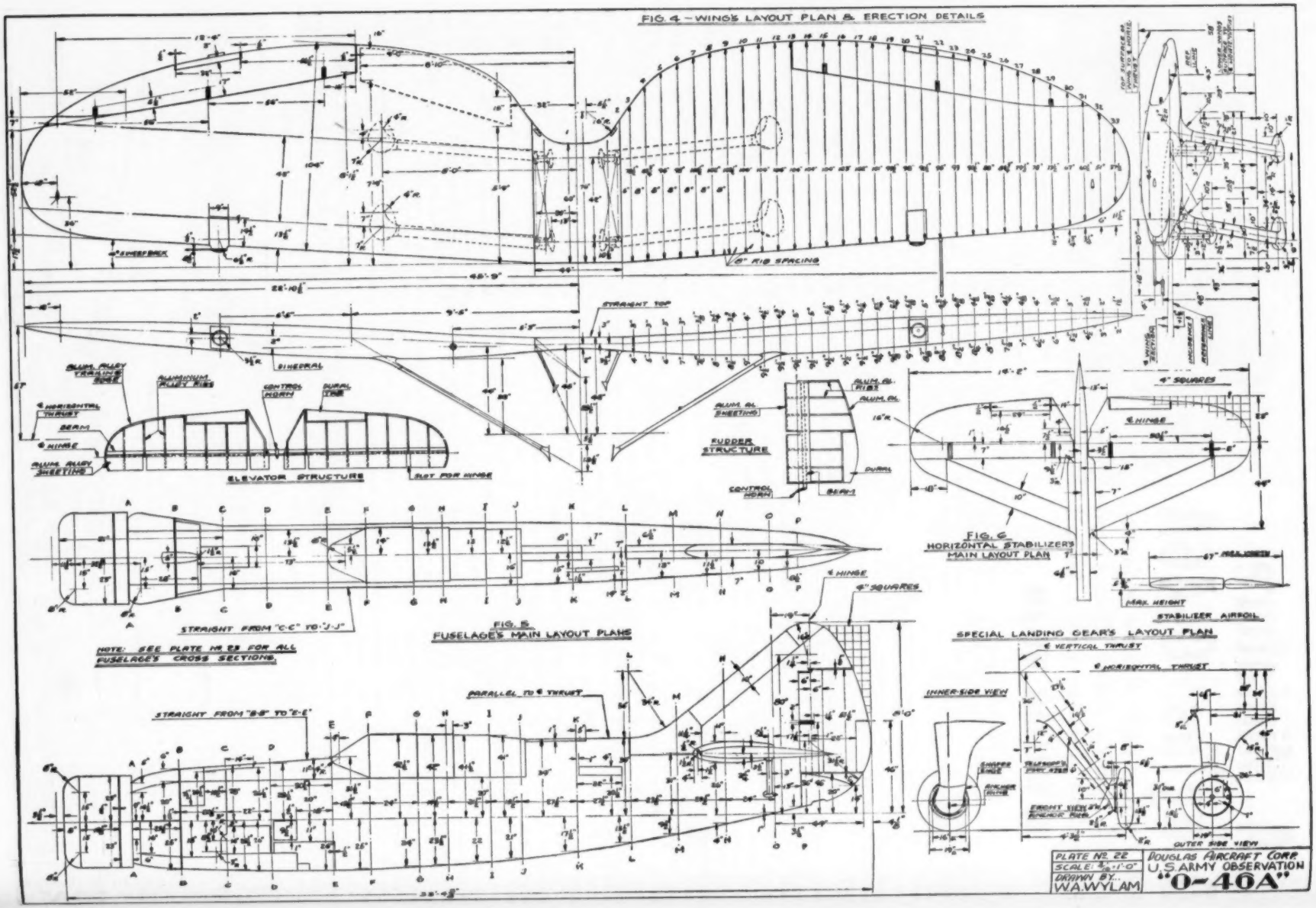


FIG. 4 – WINGS LAYOUT PLAN & ERECTION DETAILS
ELEVATOR STRUCTURE
RUDDER STRUCTURE
FIG. 5
FUSELAGE'S MAIN LAYOUT PLANE
FIG. 6
HORIZONTAL STABILIZER'S MAIN LAYOUT PLAN
SPECIAL LANDING GEAR'S LAYOUT PLAN
PLATE Nº 22
SCALE: 3/4"-1'-0"
DRAWN BY W.A.WYLAM
DOUGLAS AIRCRAFT CORP.
U.S. ARMY OBSERVATION
"O-40A"

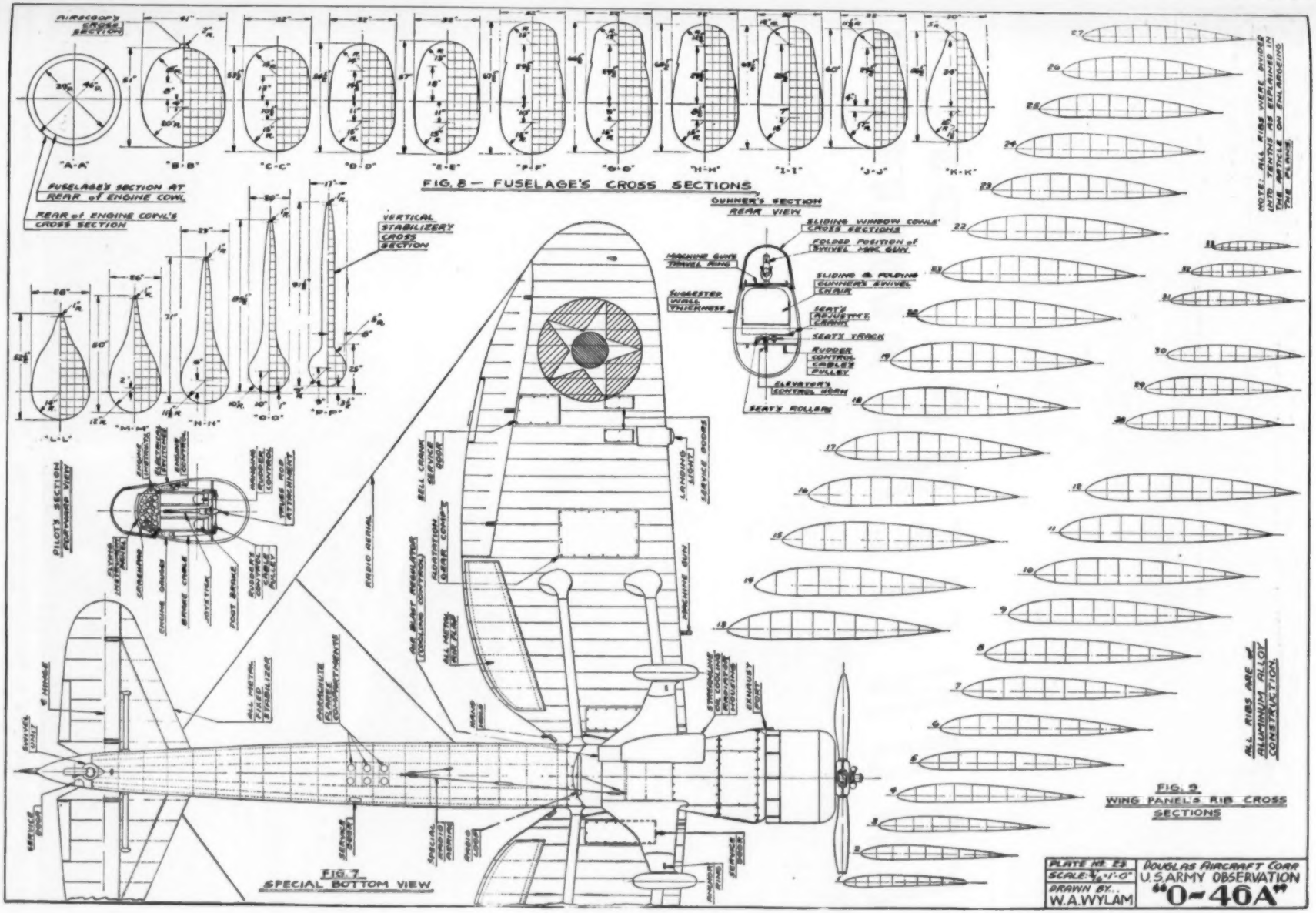
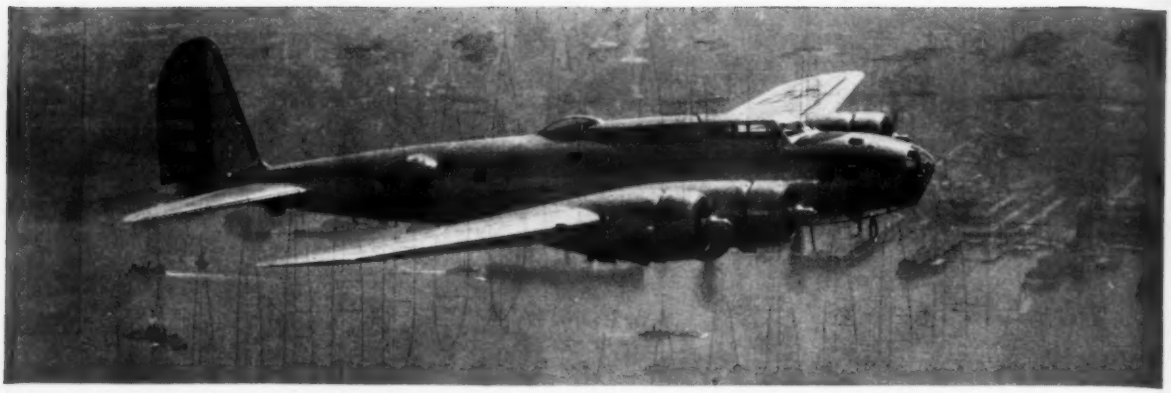


FIG. 8 — FUSELAGE'S CROSS SECTIONS
FUSELAGE'S SECTION AT REAR of ENGINE COWL
REAR of ENGINE COWL'S CROSS SECTION
VERTICAL STABILIZER'S CROSS SECTION
GUNNER'S SECTION REAR VIEW
SLIDING WINDOW COWLS' CROSS SECTIONS
FOLDED POSITION of SWIVEL MK. GUN
SLIDING & FOLDING GUNNER'S SWIVEL CHAIR
SEAT'S ADJUSTING LEVERS
SEAT'S TRACK
RUDDER CONTROL CABLES PULLEY
ELEVATOR'S CONTROL HORN
SEAT'S ROLLER
PILOT'S SECTION FORWARD VIEW
FIG. 7 SPECIAL BOTTOM VIEW
FIG. 9 WING PANEL'S RIB CROSS SECTIONS
NOTE: ALL RIBS WERE PROVIDED WITH TRUING AS EXPLAINED IN THE ARTICLE ON ENLARGING THE PLANE
ALL RIBS ARE OF ALUMINUM ALLOY CONSTRUCTION
PLATE Nº 23
SCALE: 1/4"-1'-0"
DRAWN BY.. W.A.WYLAM
DOUGLAS AIRCRAFT CORP
U.S.ARMY OBSERVATION
"O-46A"



The army's new Flying Fortress, the Boeing B17-B, flew from coast to coast in 9 hrs. 15 min., at an altitude of 4 miles or over. (Arnold)

FRONTIERS OF AVIATION

Dornier Do. 17 bombers in flight. Germany is depending on ships like these to destroy her enemies. (Monkmeyer)

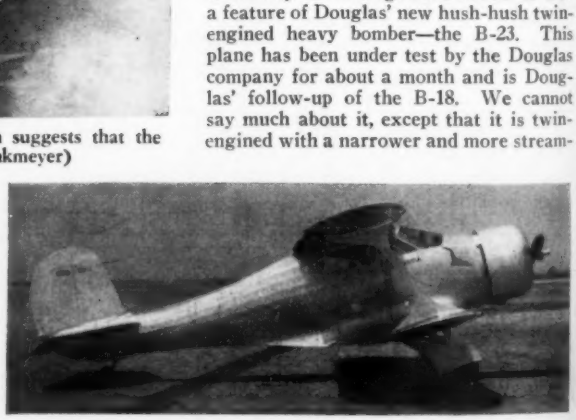
NOW that the new Lockheed designs, namely the Model 16, Model 27 and Model 44, are rapidly progressing, we hear of another new Lockheed commercial airplane now on the drawing boards. It is a big one, larger than the Douglas DC-4. Another big airplane is planned at the Consolidated Aircraft Corp. plant. Their Model 28 is the twin-engined flyingboat now undergoing trans-Atlantic experiments for American Export Airlines and the one recently delivered to the Royal Air Force via the Atlantic Ocean. From the Model 28 the company jumped to the Model 31 when it produced their new long range flyingboat powered by two 2000 hp. Wright engines. Thus the question arose as to what the Model 29 would be, and Consolidated has announced that it will be a four-engined commercial flyingboat. American Export is a likely purchaser. The Model 30 is a 4-engined bomber.

The airplane in many respects resembles the navy four-engined Consolidated ships with wing tip retracting floats. It may be powered by Wright's new 2000 hp. engine or the new eighteen cylinder Pratt & Whitney engine that is causing quite a sensation. The Wright engine is known as the Duplex-Cyclone. Not to be outdone by Wright, however, Pratt & Whitney has produced this new engine in the same power class, but with a very small frontal area that offers excellent streamlining for the big ships. Four of these engines in the big Consolidated flyingboat would give it plenty of speed: A total of 8,000 horsepower. It will be a "double-decker" with luxurious accommodations for passengers.

Boeing's four-engined B-17B bombers now being delivered to the army air corps with turbo-superchargers carry larger rudders than on the YB-17. They resemble the rudders used on the commercial "307" Boeing transports. With multi-engined aircraft there is a tendency to "hunt" (sway from side to side) and a large vertical tail surface is the best way to remedy it. A large area rudder is also a feature of Douglas' new hush-hush twin-engined heavy bomber—the B-23. This plane has been under test by the Douglas company for about a month and is Douglas' follow-up of the B-18. We cannot say much about it, except that it is twin-engined with a narrower and more stream-

The latest French Amiot 350 bomber in flight. Its beautiful design suggests that the French airplanes are a match for any German ship. (Monkmeyer)

The Paulic XT3-B, prototype of the Boeing School's all-metal plane. Rudy Paulic built it in his spare time. (By Larkin)



Here's the latest personnel plane of the U.S. Navy. Note the error in designation. The G should be on the rudder. (Thorell)

The Beechcraft 18-S transport powered with two 450 hp. Wasp Jr. engines. (Morrison)

By
ROBERT MORRISON

lined fuselage than the B-18 and is much faster. It is the last word in that type of bomber.

Douglas's little twin-engined attack-bomber is also coming along rapidly, and we hear that Glenn L. Martin are delivering their attack-bombers to France already! The Douglas (Northrop) single-engined attack planes, similar to the A-17, that are being shipped to the Netherlands look "wicked" in their brown camouflage war paint.

It did not take Harlow Aircraft long to build their two-place tandem military trainer and get it in the air. Test flights have been made in the plane with success. With three having been ordered by the CAA already, the company has been able to go ahead with a spurt and has intentions of building fifty planes in its first production schedule. These will mostly go to distributors all over the country who have contracted with the Harlow company. Just recently organized, the company has picked an ideal location at Alhambra Airport. If business becomes as good as they expect they will perhaps be able to expand into the famous quadrangular hangar at the field, another long hangar and building and might use the present terminal building as an office.

Known as the PC-5, the new Harlow is of all-metal construction and closely resembles the PJC-1 except that it has a narrower fuselage and an enclosure in place of a cabin. The powerplant is a 145 hp. Warner "Super Scarab" engine which is fed from a 34 gallon tank. The

The latest Vought-Sikorsky XOS2U-1 observation scout as a landplane. It is being produced in quantity for the U.S. Navy. (Morrison)

flap area is very large considering the size of the airplane and must be very effective in landings. They are perforated and electrically operated. Following are the specifications of the Harlow PC-5 which answers the question why the Harlow is becoming so popular.

The new low-wing Fairchild Trainer, described in "Frontiers," October issue. It is powered by a Ranger engine. (Morrison)

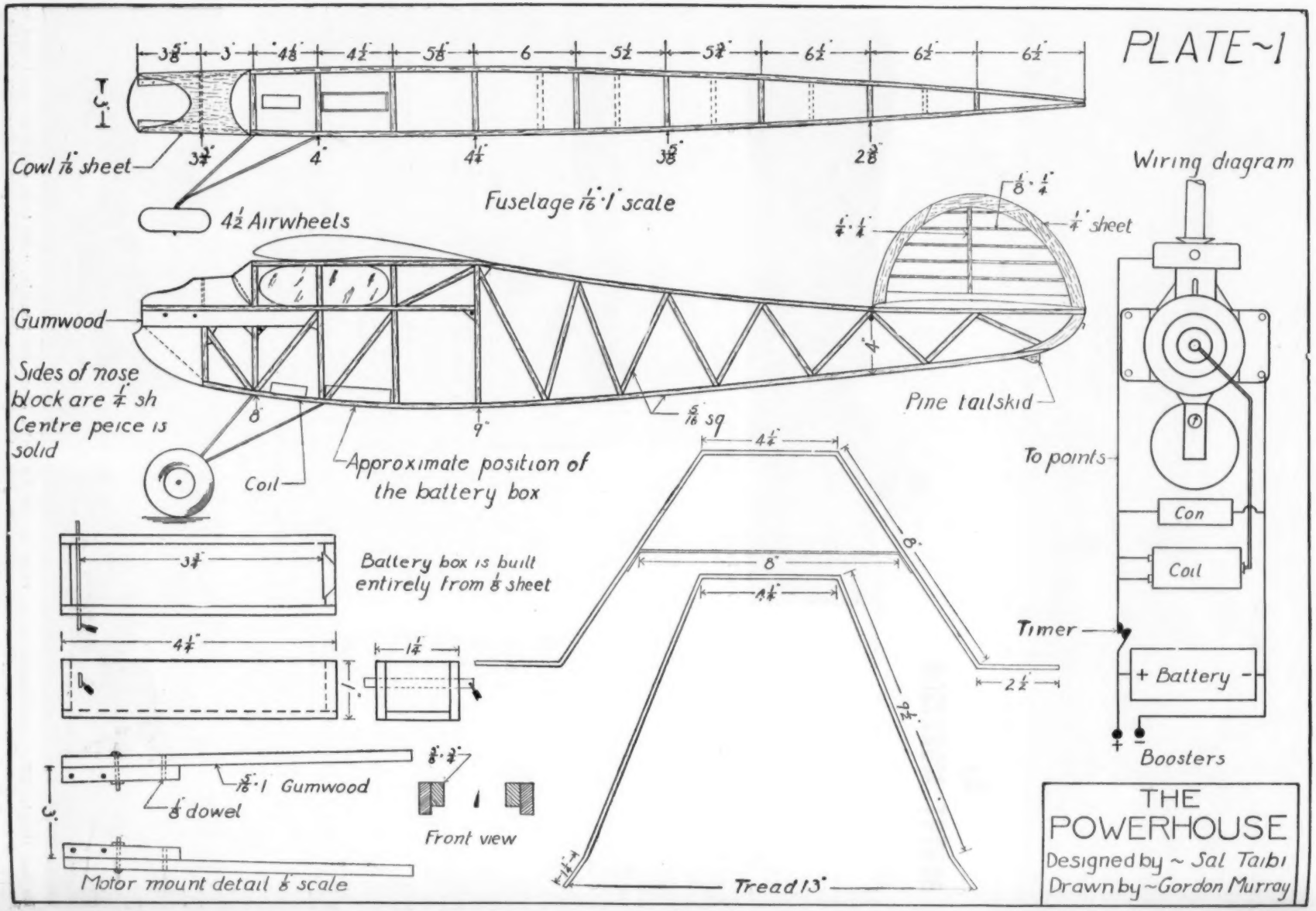
Wing Span, 35' 9.75"; Length, 23' 4"; Height, 7' 8"; Wing Area, 185 sq. ft.; Wing Loading, 12.31 lb./sq. ft.; Power Loading, 15.71 lb./sq. ft.; Weight Empty, 1640 lb. Useful Load, 639 lb.; Gross Weight, 2279 lb.; Flap Area, 23.6 sq. ft.; Maximum Speed, 170 m.p.h.; Cruising Speed, 160 m.p.h.; Landing Speed, 45 m.p.h.; Rate of Climb, 850 ft./min.; Service Ceiling, 16,500 ft.; Cruising Range, 600 miles.

As this is written the air corps has announced the allotment of another portion of the $300,000,000 that it is giving away to needy airplane manufacturers. So far it looks like North American Aviation is leading the pack as far as the number of contracts go. In the first $50,000,000 allotment the company gained one order, but in the second allotment of $100,000,000, approximately, North American gained three separate orders! Other companies figuring in the contracts were Martin, Stearman, Boeing, Consolidated,

(Continued on page 64)

The first Douglas DB-7 attack-bomber of an order of 150 for France. A revised version of the plane that crashed last Jan.

One of the latest Russian flying boats which has just landed on the water. Note the radiator cowl in front of the engine. (Sovfoto)


PLATE~1
3⅜ 3 4⅛ 4½ 5⅛ 6 5½ 5⅞ 6½ 6½ 6½
Cowl 1/16 sheet
3½
4
4½
3⅝
2⅜
Fuselage 1/16"·1" scale
4½ Airwheels
Wiring diagram
⅛·¼
¼·¼
¼" sheet
Gumwood
Sides of nose block are ¼ sh
Centre peice is solid
8
9
5/16 sq
Pine tailskid
Coil
Approximate position of the battery box
To points
Con
Coil
Timer
+ Battery -
Boosters
3½
4¼
1¼
Battery box is built entirely from ⅛ sheet
4½
8
8
4¼
2½
9½
5/16·1 Gumwood
⅛ dowel
⅛·¾
Front view
Motor mount detail ½ scale
Tread 13
THE POWERHOUSE
Designed by ~ Sal Taibi
Drawn by ~ Gordon Murray

It is properly designed for stability and high performance

It is powerful, sturdy and of simple construction

BUILDING THE "POWER HOUSE"

A High Powered Contest Model That Climbs Straight Up—Equipped With Pontoons It Won the First Official Seaplane Contest

By SAL TAIBI

Part I

THIS business of "packing" power in ships has long been carried to extremes. Engines of a quarter—or even a third—horsepower have been built into tiny ships, giving them a startling climb, but seldom if ever does the glide match that stupendous rise under power.

We have always figured that, given enough power to obtain a good climb, a big ship had considerable advantage in the glide.

We recall seeing a pilot and a mechanic (from an adjacent airport) standing near the starting line when we started the motor of the Powerhouse in a recent meet. The pilot turned to the mechanic and said, in a "know-it-all" manner:

"There's a big job . . . sloppy climb, no power."

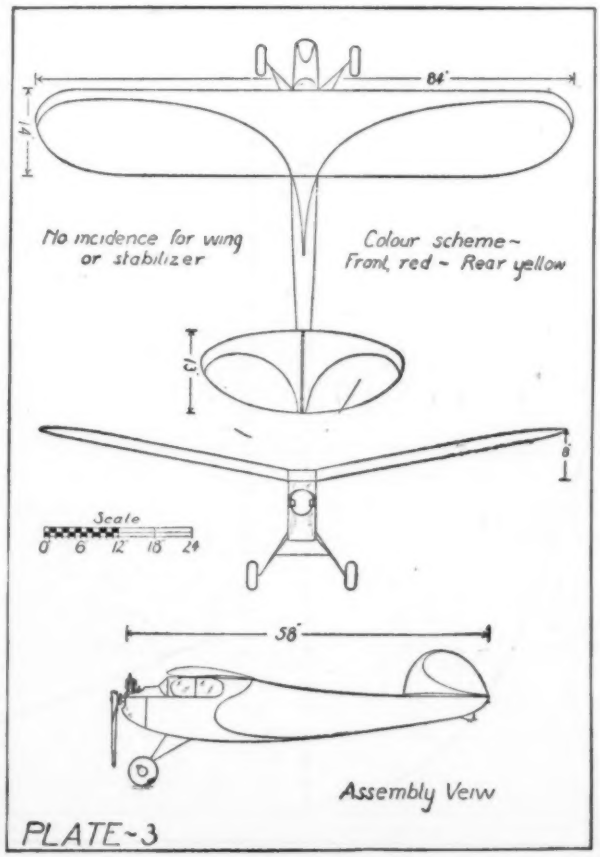
He almost ate his words when the ship was launched. In twenty seconds the Powerhouse had gained tremendous altitude. When the motor cut out, a strong wind carried the ship off the field and despite an excellent flight we had no joy in our hearts for the plane was lost. We hired a Cub to look for the job from the air, but to no avail. Our only consolation was that, at last, we had developed a fast climbing large gas job, and as such we now present—The Powerhouse.

Just a brief history of the ship:

In the first appearance of the Powerhouse, at Creedmore, L.I. on February 12th at a contest sponsored by the Metropolitan Model Airplane Council, the ship did 6:04 out-of-sight, and took first prize in the Class C group. Later it took first place in the Haaren High School Model Airplane Contest, doing 2:35 for the best flight of the day, despite a 30 m.p.h. wind. Equipped with floats the ship took first honors in the first annual Eastern States Gas Model Seaplane Contest on August 20 at Lake Hopatcong, N.J., averaging 1:07, establishing a new world's record for gas model seaplanes. In addition the ship has taken a number of other prizes in eastern contests. Four foot, five-foot and six-foot versions of the ship, powered with Class B and smaller Class C motors (Browns, Dennymites, etc.), have also made fine showings and won several prizes.

In the first place a big ship is more stable, responds to adjustments more easily, and is less inclined to be critical and cranky. A big ship has but one disadvantage . . . it's a trifle hard to transport. Otherwise, give us a big ship that can really take advantage of a thermal and make the most of any altitude it may get.

The Powerhouse represents a development in design, and as is the case with most models, it took almost a year before the design was finally perfected. In contest work we had always noted the failure of planes with large wing spans to obtain a sufficient altitude. Of course, once they did get "up there" they performed beautifully, but the difficulty lay in the climb. The first ships we built did not come up to our expectations so we traced the trouble to several small elements. One of the large jobs was too heavy, although it performed beautifully AFTER it got sufficient altitude. But 20 seconds was far too little time in which to get the job up, so we abandoned that design.



The second ship had a diamond fuselage and the cabin resembled that of a blimp. The performance was as bad as that of the first job, so we firmly crushed the ship under-foot. The third ship had the familiar box-type fuselage and was an excellent performer except for one small item—the motor could not be opened wide because the ship had looping tendencies. We later found that the tail moment arm was too small. We took several high prizes with the ship in that condition, but we knew we could improve the design and built our next ship accordingly.

The principal changes were to lengthen the fuselage and increase the wing chord by an inch. That was the answer. In her first contest the ship performed sensationally.

Through several seasons of contest work we have developed such units as the nose construction, motor mountings, battery box construction, etc. and these are included in the design.

(Continued on page 62)

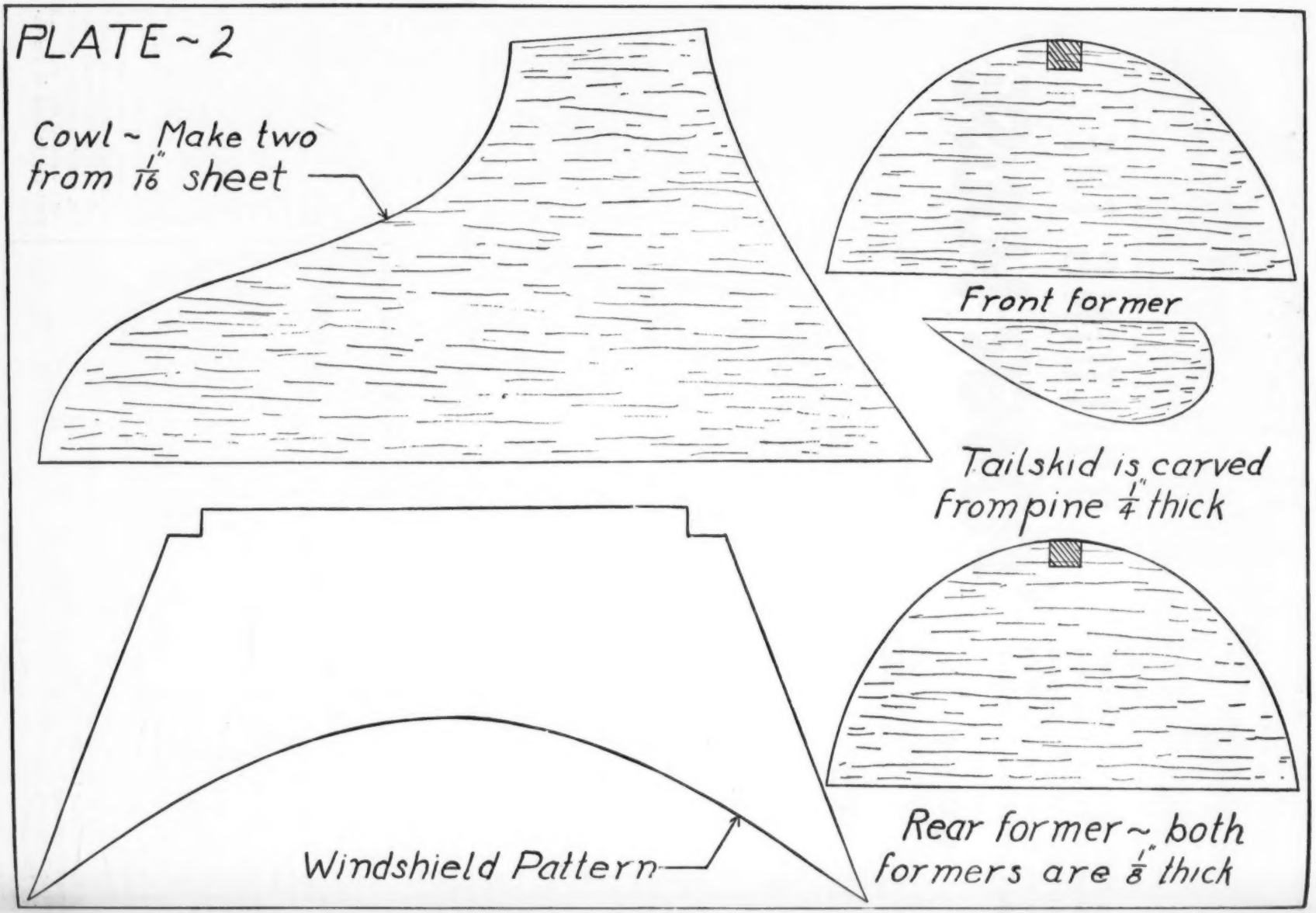


PLATE ~ 2
Cowl ~ Make two from 1/16" sheet
Front former
Tailskid is carved from pine 1/4" thick
Windshield Pattern
Rear former ~ both formers are 1/8" thick

Fundamentals Of Model Plane Design

The Effect of Speed Upon the Lift of a Wing and How the Lift and Speed of Any Airfoil May Be Determined Without Wind Tunnel Data

By CHARLES HAMPSON GRANT

Chapter No. 1—Article No. 4

IN examining all the factors which effect the lift of a wing, we must not forget the most important one, "speed," or velocity. It is obvious that the *more* air particles that are displaced or deflected by the wing at any given angle of attack, the greater the "lift" will be. Also the *harder* each particle strikes the wing, the greater the lift will be. This is just what happens when the speed of the wing increases.

If we have a wing that lifts two ounces at five miles per hour and we double the wing velocity, what happens? At ten miles per hour, twice as many particles are striking the wing per minute, thus generating twice the lifting effect because of this fact. Also these particles strike the wing *twice as hard*, which fact again causes the lift to double. So instead of the lift of two ounces, generated at five miles per hour, we have two ounces × 2 × 2, or eight ounces of lift at ten miles per hour. In other words we can say that the lift is proportional to the velocity squared, or: $L = KV^2$.

Where L = Lift, V = velocity and K = (a Constant) which need not be known when proportional values are to be found.

So far the following facts have become evident:

1. The greater the wing area, the greater the lift of the wing.

2. The "lift" is proportional to the camber, or fineness ration for any given type of wing section. (This is the height of the wing curve divided by the chord.) If the chord is four inches and the camber is half an inch, then the fineness ratio is 1/8.

3. The "lift" is proportional to the square of the speed at which the wing moves through the air.

Taking these points into account we can write a formula for the lift generated by a wing as follows: $L = KF_cAV^2$.

Where L = Lift in ounces, F_c = the height of camber relative to the chord (For example 1/12), A = the area of the wing (single surface) in square inches, and V = the speed or velocity in miles per hour. K is a constant whose value depends upon the shape of the wing section, the *angle of attack* and the density of the air. However for practical purposes, a value of (0.002) may be given to K. This value of, K = 0.002, will give approximate results for a single surface wings at a three degree angle of attack. The formula may be written: $L = (0.002)\ F_cAV^2$.

If we wish a formula that will be correct for double surface wings as well as single surface ones, we should substitute

$$\left(\frac{3\ H_u + H_b}{4C}\right)$$

the camber factor for F_c in the formula, which will then be

$$L = (0.002)\left(\frac{3H_u + H_b}{4C}\right)AV^2,$$

(When the angle of attack equals three degrees.) H_u = the camber of the upper airfoil surface in inches, H_b = the height in inches of the under or bottom airfoil surface. If we wish our formula to take into account the lift produced at any particular angle of attack it must be multiplied by the quantity, $\left(\frac{3 + I}{6}\right)$, where I equals the angle of attack or *"Angle of Incidence."* (The angle of the wing chord to the line of thrust.) The formula may now be written:

$$L = (0.002)\left(\frac{3\ H_u + H_b}{4C}\right)AV^2\left(\frac{3 + I}{6}\right)$$

This formula will give only approximate values for the lift, but will be correct enough for practical purposes. It may be used either for rubber driven or gas engine powered planes. This formula may also be written as follows:

$$L = (0.002)\ F_cAV^2\left(\frac{3 + I}{6}\right)$$

in which F_c represents the camber factor quantity

$$\left(\frac{3H_u + H_b}{4C}\right)$$

Now if the *numerical value* of the camber factor of any particular wing section is known, the lift generated by the wing may be calculated by inserting the numerical camber factor value in the formula in place of F_c.

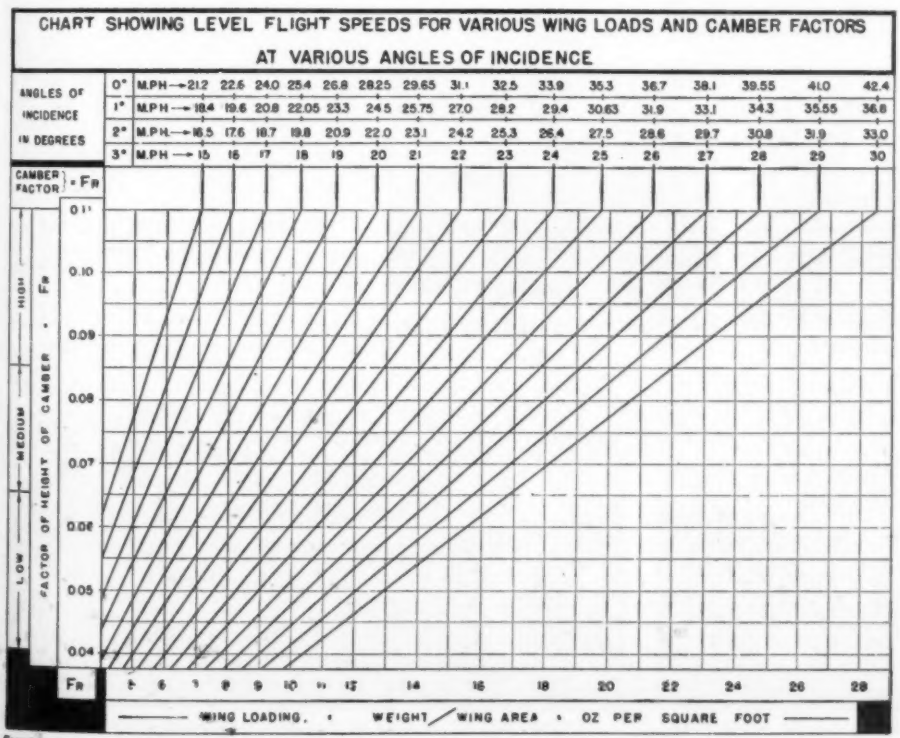
For instance, if the lift on a wing having a Grant X9 section is to be determined you should proceed as follows: First determine all of the numerical values of the factors represented by the symbols on the right side of the equation. The camber factor F_c for the Grant X9 section is (0.0692). Then if the area of the wing is to be 150 square inches, the angle of incidence three degrees, and the speed of the plane is ten miles per hour, the values are inserted in the formula as follows:

$$L = (0.002)\ (0.0692)\ (150)\ (10)^2\left(\frac{3 + 3}{6}\right)$$

or $L = (0.0001384)\ (150)$

(Continued on page 55)

CHART SHOWING LEVEL FLIGHT SPEEDS FOR VARIOUS WING LOADS AND CAMBER FACTORS AT VARIOUS ANGLES OF INCIDENCE



Copyright By Charles Hampson Grant.

GAS LINES

I. G. M. A. A. NEWS

Pict. No. 1. Walter Saline's tailless model reaches for the clouds at the Eastern States Gas Model Contest

What Should the Gas Model Rules Be?—News of the First Seaplane Meet—Eastern States Contest

Pict. No. 12. This biplane was flown all day long

DURING the summer season gas model events have taken place in rapid succession. In order to give you all the interesting news pertaining to the hundreds of contests held throughout the country we would have had to publish the magazine every day, rather than once a month. Consequently in this issue we are able only to give a few highlights of outstanding contests and some pertinent remarks which are of importance to every gas model fan.

One of the items which is represented by a large question mark in the eyes of many model builders is the present gas model rules. Judging from the many letters which come into the "Gas Lines" editor, we believe that the present rule is unsatisfactory to a large group of model builders throughout the country.

MODEL AIRPLANE NEWS is most anxious to represent and express the true feelings of gas modelers concerning the present rule and possible changes that should be made. If you have any objections to the present rules and if you have any rules which you feel would afford gas model fliers a larger scope of experimentation and action, write to us immediately and let us know about them. Then, through "Gas Lines," we can give complete and accurate expression of all gas model builders' opinions.

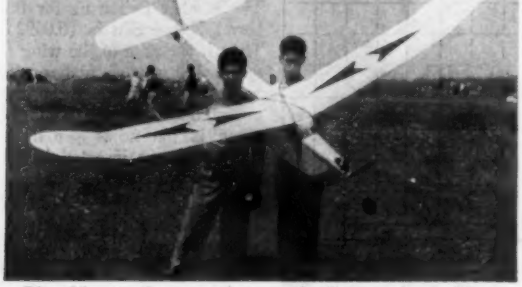
The letters received up to the present moment have made us suspicious that the present rules are not received with great favor, especially the rule which embodies three categories of cubic inch piston displacement and wing area. We are constantly endeavoring to improve and establish rules which will not restrict model builders in the design or construction of their planes, except inasmuch as safety is concerned. We have no axe to grind for or against any individual or group of model builders—our whole objective is to express and work for the fulfillment of the will of the majority of model builders throughout the country. We will continue to follow this policy under all circumstances and endeavor to defeat any minority groups who attempt to force rulings which are not popular with the majority. We feel that any minority group which follows this course is being motivated by selfish interest rather than the desire to promote the welfare of model builders and model aviation as a whole.

In order to make this policy of the greatest good for the greatest number of fliers, we urge each and every model club to join the International Gas Model Airplane Association. As old readers know,

Pict. No. 10. Joe Fritsch's beautiful three wheeler

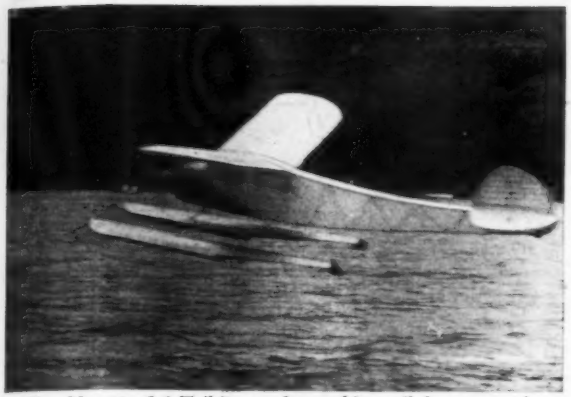
Pict. No. 6. Kopneck is proud of his gas "babies"

Pict. No. 7. Shurman's one wheeler



Pict. No. 2. Largest plane at the Eastern States Meet

Pict. No. 3. A good way to have your flight disqualified



Pict. No. 13. Sal Taibi's seaplane taking off for a record

Pict. No. 14. Contestants and planes at the first seaplane meet

this organization has been reestablished and is now well under way. The purpose of the organization is to provide a means of unlimited and unrestricted expression of model leaders and model builders throughout the country: A means which will allow them to voice their opinions and thereby mold a procedure which will benefit all who are truly interested in this sport. It is planned that an annual meeting or convention of IGMAA leaders and members will be held. More news will be given about this later, when the IGMAA is reorganized to a greater extent.

For approximately 2 1/2 years MODEL AIRPLANE NEWS has been in favor of the following rule for gas models:

(1) That the wing loading shall not be less than eight ounces per square foot. (2) That the weight of any gas model shall not be less than five times the cubic inch piston displacement of the engine, the answer to be in pounds. For example: A Brown powered ship could not weigh less than five times .6, or three pounds. (3) That under this rule there shall be three categories; these categories to be: (a) For planes with engines of piston displacement from 0 to .2 cubic inches inclusive. (b) For planes with engines of piston displacement of more than .2 and up to and including .3. (c) For planes with engines of cubic inch piston displacement of more than .3.

An objection by some model builders was raised to the first two parts of this rule because they claimed that the Reynolds number had a decided effect on the flight of models; that is, very small planes with the same wing loading as large planes did not perform as well as the larger ones. However, dividing the planes into three categories, as given here, should overcome this objection. Another alternative in respect to the division into categories may be wing area, provided the cubic inch piston displacement division does not satisfy the fancy of model builders.

This rule puts every plane in any class, regardless of its size, wing area, weight, etc. on the same basis—which is more than can be said of the present rule. Thus it allows a greater scope of experiment in designing and building, which is the chief objective of model builders. To limit model builders in any particular phase of their work takes away a great deal of the joy of this sport.

We urgently request all readers to write us their opinions of this rule, whether

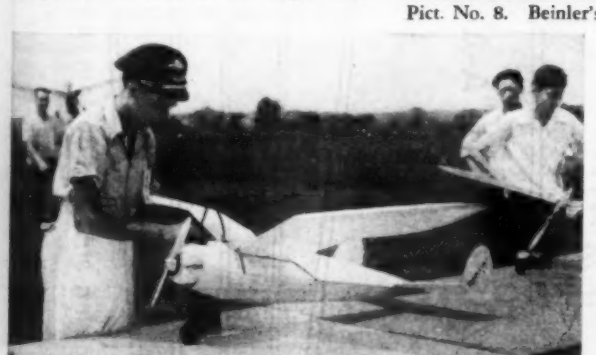
(Continued on page 44)

Pict. No. 15. Winners of the seaplane meet

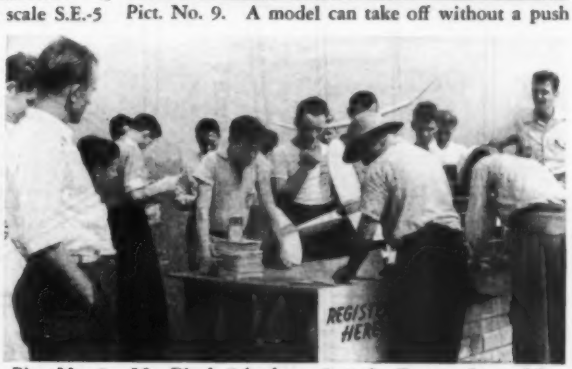
Pict. No. 11. One of the finest flying tailless planes we've seen

Pict. No. 8. Beinler's scale S.E.-5

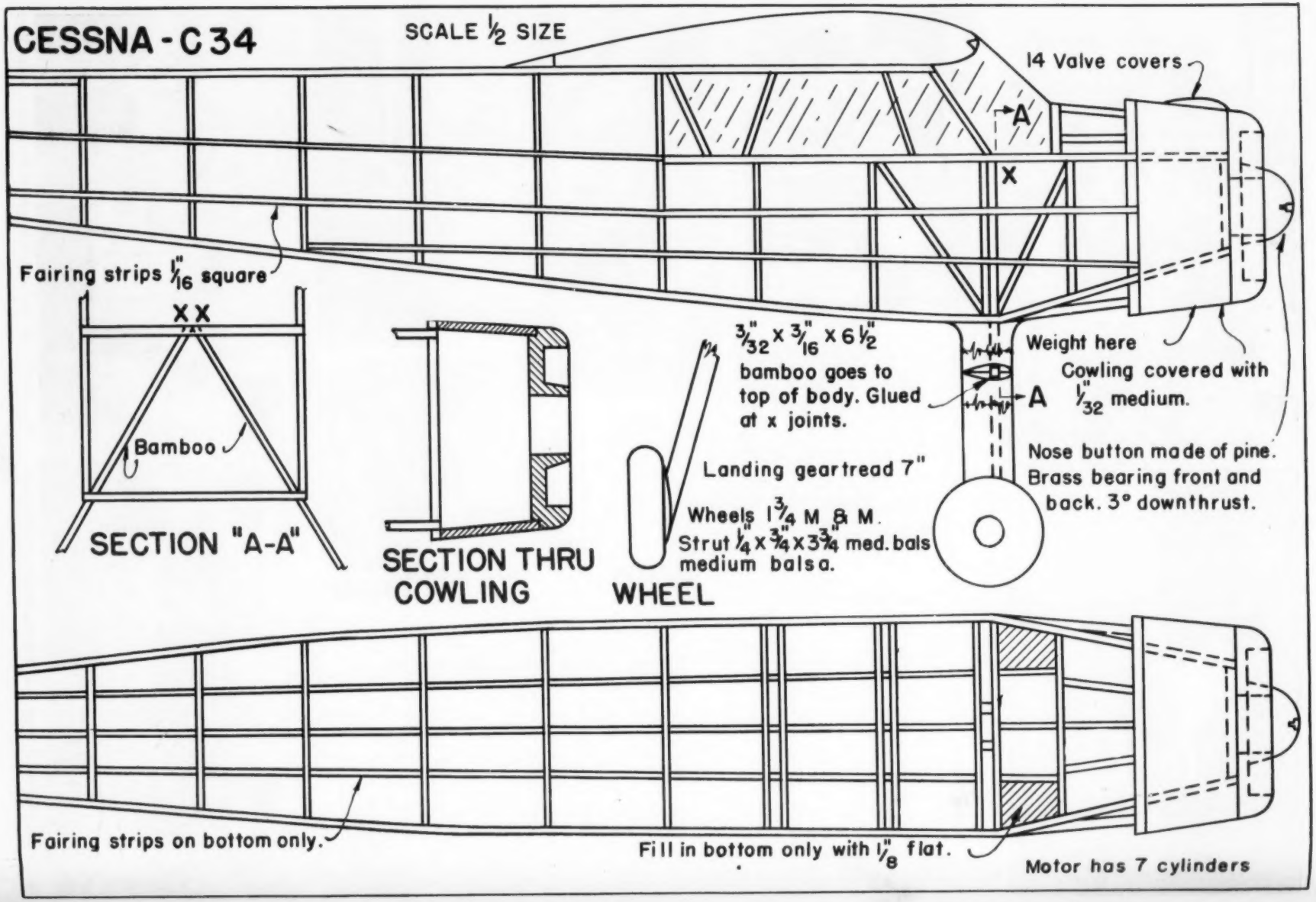
Pict. No. 9. A model can take off without a push

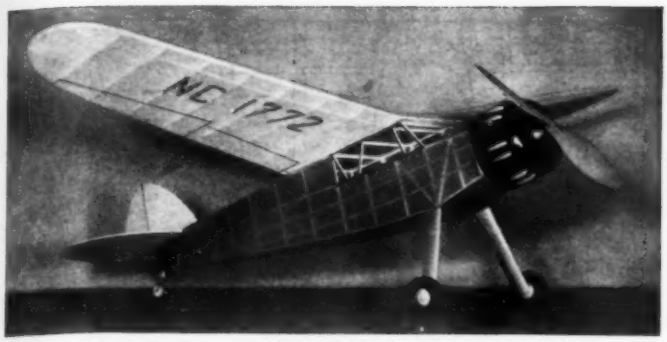


Pict. No. 4. Armand Vanquez and his beautiful gull-wing plane



Pict. No. 5. Mr. Block "checks up" at the Eastern States Meet


CESSNA - C34
SCALE ½ SIZE
14 Valve covers
A
X
Fairing strips 1/16" square
XX
Bamboo
SECTION "A-A"
SECTION THRU COWLING
WHEEL
3/32" x 3/16" x 6½" bamboo goes to top of body. Glued at x joints.
Landing gear tread 7"
Wheels 1¾ M & M.
Strut ¼" x ¾" x 3¾" med. bals medium balsa.
Weight here
Cowling covered with 1/32" medium.
A
Nose button made of pine. Brass bearing front and back. 3° downthrust.
Fairing strips on bottom only.
Fill in bottom only with 1/8" flat.
Motor has 7 cylinders



This is how your model should look when it is finished

A TROPHY WINNING CESSNA

By DICK KORDA

How You Can Build One of The Finest Scale Models Ever Flown—Sturdy and Realistic in Appearance. It Has Flown For More Than Two Minutes and Won a National Contest

NOW that the flying scale model is part of all major contests, the main question is: which one to build? The answer to this question during the Scripps-Howard National Contest in Akron last year proved to be the Cessna C-34. It took first place in the eliminations in Cleveland, with a flight of one minute, and also took first place in the finals in Akron with a flight of two minutes, five seconds. The winning flight was made in a strong breeze covering over half a mile before it disappeared behind a small woods. The points given for first place in this event were just enough to help tie as high point man and gain partial possession of the Al Williams Trophy.

Fuselage

The fuselage is built up of 3/32" square hard balsa, the two sides being laid out and joined together the same as a regular fuselage model. The cowling is built next and is covered with 1/16" medium balsa. Two tappet covers are glued on over each cylinder. The size of the cowling may be obtained from the top and side view drawings. Make the seven cylinder motor as complete as possible to help gain points in contests. After the motor and cowling are finished glue them to the fuselage and add the stringers as shown. Drill a hole through the landing gear block on the bottom of the fuselage and slide the bamboo strut through, gluing it to the block and also to the cross brace in the body. Then using a plastic wood made of cement and sawdust, form a fillet where the landing gear joins the body. Airwheels are held on the axle with a drop of cement.

The wire tail wheel strut is cemented to a balsa plate which is fitted inside the last upright on the body. The body is covered with small strips of paper from the cowl to the landing gear only. From there back it may be covered with one piece of paper to each side. After spraying with water no wrinkles will appear. Next put on the side windows, using dope instead of cement to avoid wrinkling the celluloid. The windshield is not fitted on until the wing has been glued to the fuselage. All longerons and uprights showing through the windows should be covered with 3/32" strips of black paper.

Wing

Lay out the entire wing, minus the spars, and allow to dry completely. After putting in the center section spars, crack the leading edge and put blocks under the tips for dihedral. Glue in the top spars and allow to dry, then turn over and glue in the bottom spars. Sand off bumps on ribs between spars from the last spar to the leading edge as this will eliminate unsightly bumps on the wing after covering. Cover wing and spray with water. When dry give it two coats of thin clear dope. Then put on the license numbers and cement the wing in place on body. The correct place is given on the plans. Landing flaps and ailerons are indicated by 1/16" strips of black paper.

In full flight, as shown here, it gives the appearance of a full scale plane

Tail

Make the stabilizer outline of 3/32" by 3/16" balsa, with one 1/8" spar running across. Bend 1/16" square strips across to form a streamline section. Cover the stabilizer with paper, grain running the same way as the ribs, but do not cover the bottom center section of the stabilizer as this part fits into a slot on the fuselage. Indicate elevators with a 1/16" strip of black paper.

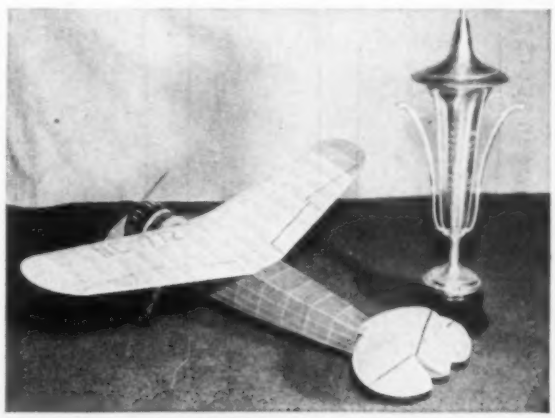
Make the rudder the same as the stabilizer, with the exception of the bottom rib which is made of 1/16" by 3/16" balsa.

Propeller

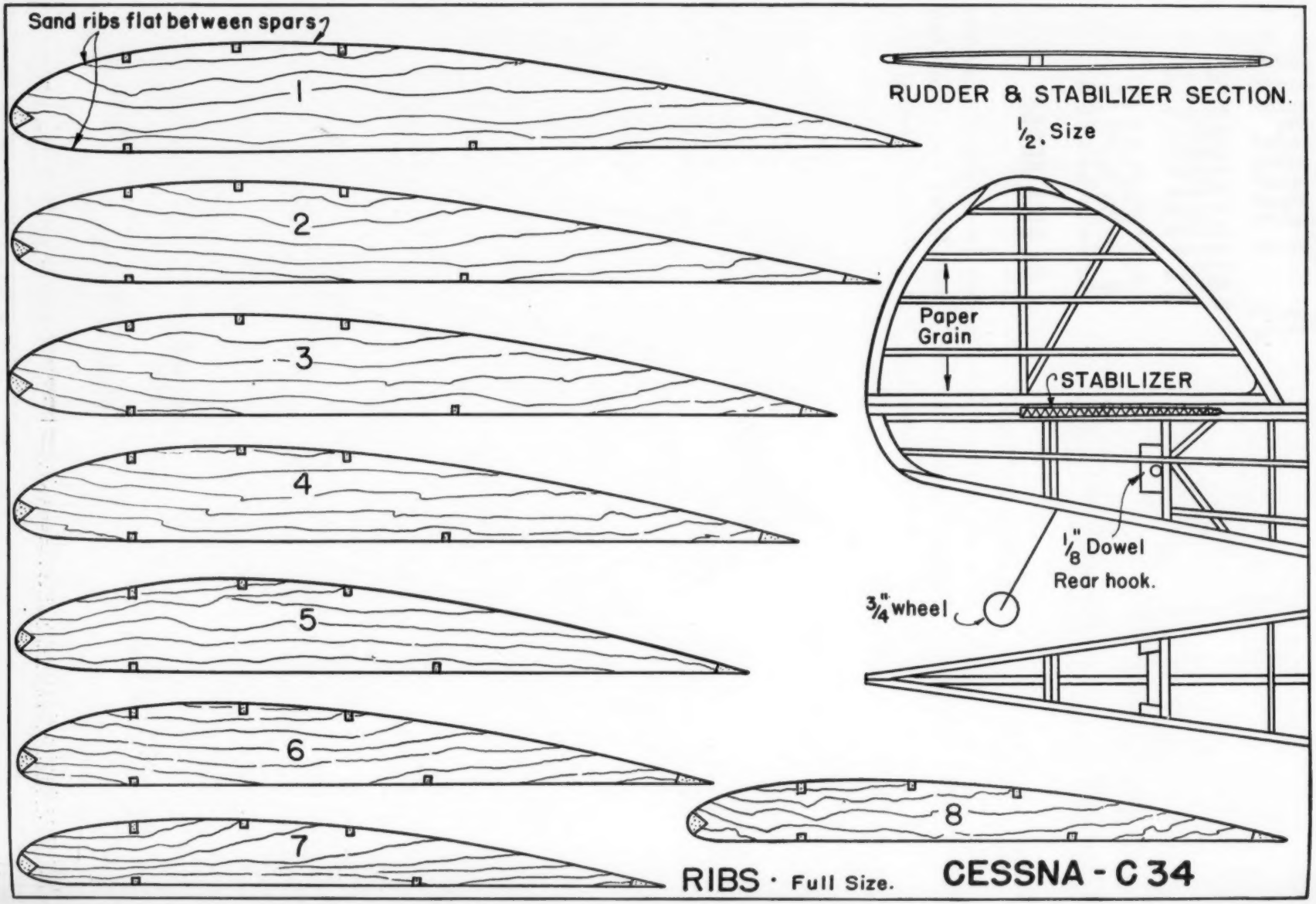
The propeller is carved from a block 1-1/4" by 1-3/4" by 11 inches. Leave the hub 1/4" thick, taper the blades 3/16" at the hub to 1/16" at the tip of the blade. Give it five or six coats of dope, sanding it between coats. Cement the free-wheeling on firmly, and paint the propeller silver. The propeller shaft is made of 1/16" music wire.

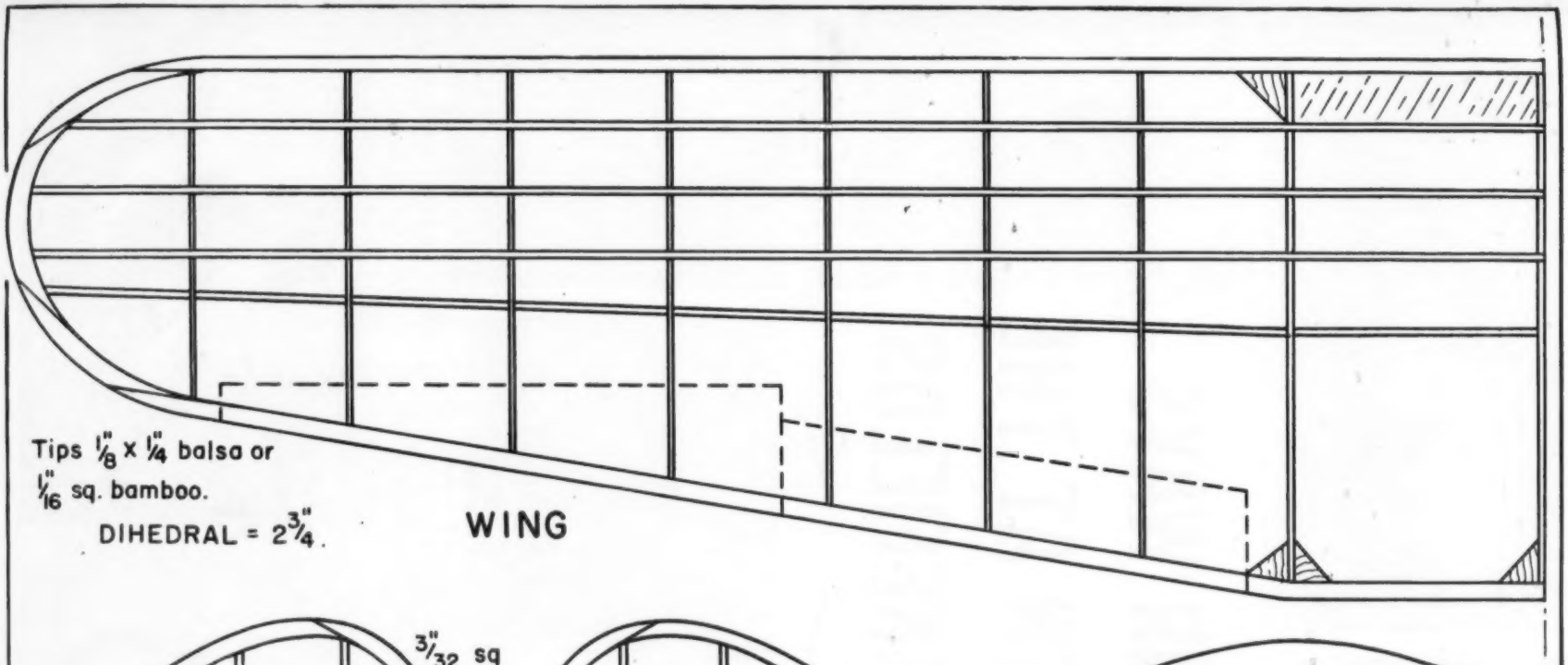
Flying

Make an eight strand motor of 1/8" rubber 50 inches long, wiping it free of all dust and grit and lubricating well. Tie a weight on a long piece of string and drop through the nose of fuselage over the rear hook and back out of the nose. Pull the motor through fuselage, forming a 16 strand motor, 25 inches long. Since the model is naturally tail-heavy, add weight inside of the cowling until the model glides evenly. By adding the correct amount of down- and side-thrust the model can be made to climb almost vertical, attaining several hundred feet altitude before the free wheeling "kicks in." The flying weight is 4-1/2 ounces.

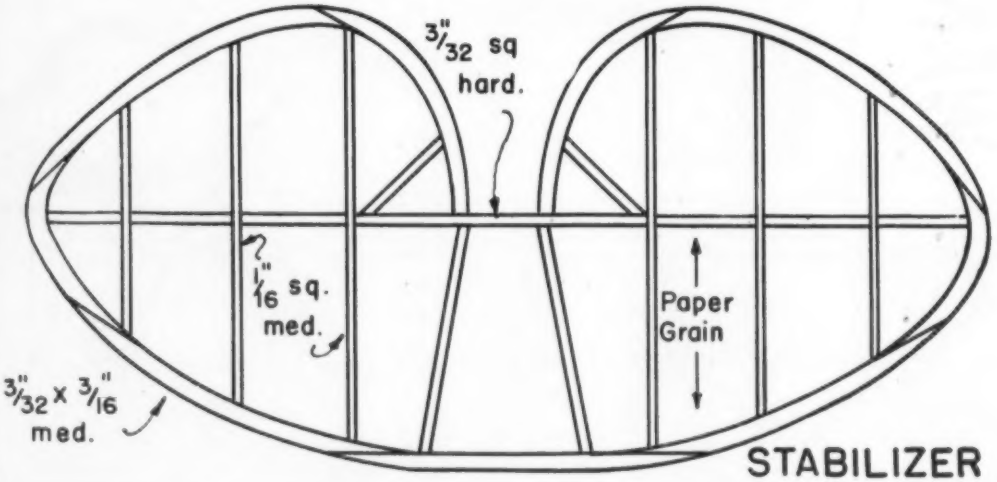


The author's model and the trophy it won. It's fine performance is due to correct proportions and light construction

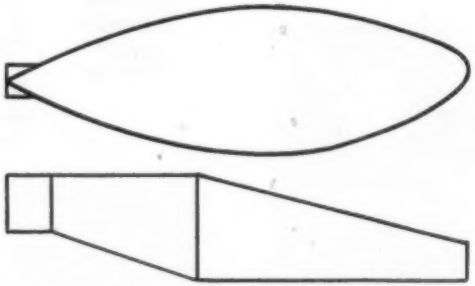

Sand ribs flat between spars
1
2
3
4
5
6
7
8
RUDDER & STABILIZER SECTION.
1/2. Size
Paper Grain
STABILIZER
1/8" Dowel
Rear hook.
3/4" wheel
RIBS · Full Size.
CESSNA - C 34



WING



STABILIZER



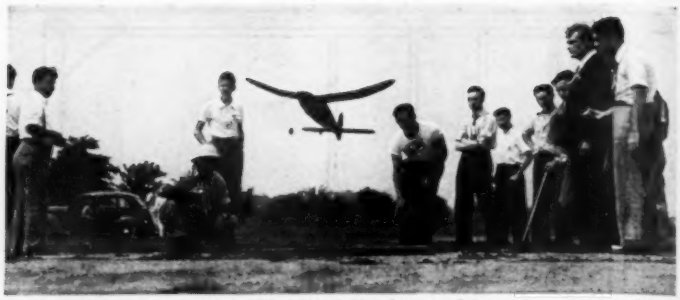
PROPELLER VIEWS

CESSNA - C34

SCALE - 1/2 SIZE.

AIR WAYS SEEN AT THE WAKEFIELDS

The winning U. S. 1939 Wakefield team. Lower row, R. to L.: Korda, Baker, Bohash. Upper: Chille, Just, Thames



A dramatic picture of the take-off of Korda's model on its winning flight. Korda watches its progress anxiously. On the right Mr. Bernarr MacFadden is an interested spectator

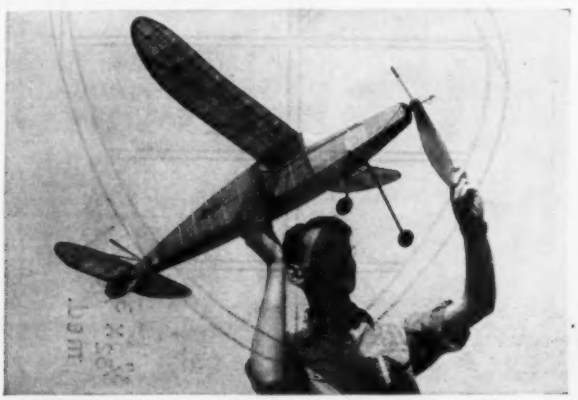
George Brown, a proxy flier, and the model from South Africa which he flew

Proxy flier Hol Hossey and the twin rudder South African ship which he flew

Ralph Baker of California and his unusual ship which he flew. Note the one wheel and peculiar fuselage

The Wakefield Trophy is presented to Dick Korda (right) by Mr. Bernarr MacFadden at the Victory Dinner following the contest. Mr. Charles Horner, pres. of the N.A.A., stands at the left

Here is LaVelle Walters, capt. of the Canadian team, and his model of unusual design. It flew very steadily



Ted Just (proxy) flew Earl Stahl's excellent ship

Fred Bowers of Canada picks up the pieces after a crash

A group at the contest watching Dick Korda's plane soaring on a thermal at 2000 ft. altitude. The model pens of various nations and the Goodyear blimp may be seen in the background

Harry York, a leading model fan and dealer from London, watches while Mary Walker "weighs in" a model

N.A.A. OFFICIAL MODEL AIRPLANE NEWS

IN ORDER to give you a more vivid conception of the International Wakefield Competition, held at Bendix, New Jersey, on Sunday, August 6th, we give you here some intimate views of the activities.

From the American viewpoint it was a great success, inasmuch as Dick Korda not only won the contest but established a new international record with his flight of 43 minutes, 10 seconds.

The success of the contest was primarily due to the hard work of Messrs. Irwin and Nathan Polk. Mr. Nathan Polk directed the contest without the help of his brother, Irwin, who was seriously ill in the hospital. The Kresge Department Store of Newark, N. J., was exceedingly helpful in lending a large amount of its equipment. The United States Army "crashed through," as it has in the past, by assigning a number of men to act as timers. Mr. Bendix allowed the use of the Bendix Golf Course on which the meet was held. The clubhouse served as a "rendezvous" for the many guests and officials who were present. Many notables attended, among the outstanding of whom was Mr. Bernarr MacFadden, who sponsored the contest and financially made it possible.

The pictures speak for themselves and give you an idea of the many interesting phases of the contest. However, a few comments concerning the characteristics of the models will not

(Continued on page 36)

Jack Minessian tests a South African entry.

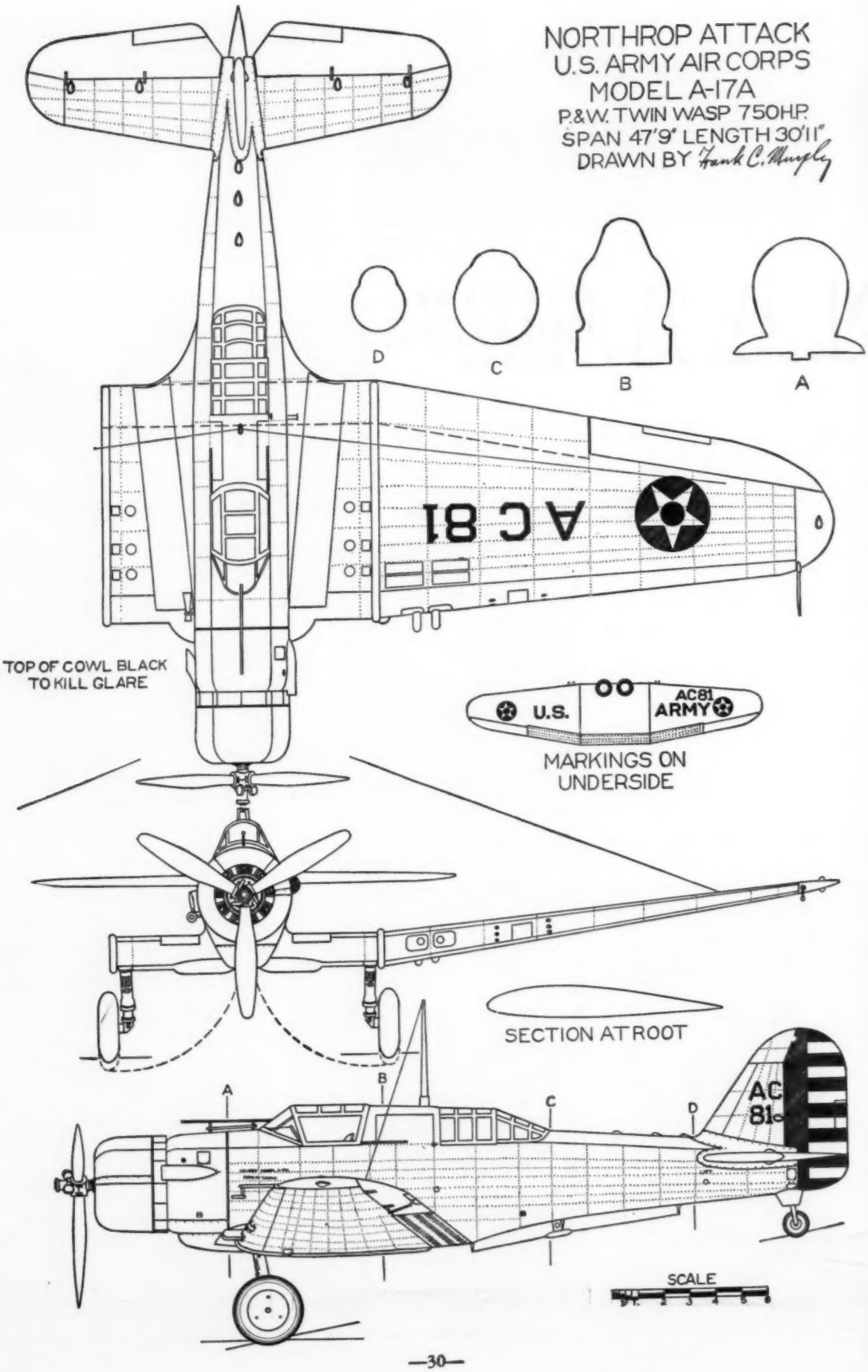
Mr. Lee of England with his beautiful super streamlined entry

Bohash of the American team and his plane. Note the folding one-blade propeller with which his ship is equipped

Dick Korda and his famous plane

Copeland of England and his ship

Friedlander and a New Zealand ship


NORTHROP ATTACK
U.S. ARMY AIR CORPS
MODEL A-17A
P.&W. TWIN WASP 750H.P.
SPAN 47'9" LENGTH 30'11"
DRAWN BY Frank C. Mingley
D
C
B
A
AC 81
TOP OF COWL BLACK
TO KILL GLARE
U.S.
AC81
ARMY
MARKINGS ON
UNDERSIDE
SECTION AT ROOT
A
B
C
D
AC
81
SCALE

The Physics Of The Airplane

THE BEHAVIOR OF FLUIDS

By LT. JAMES P. EAMES and WILLIS L. NYE

Article No. 12

PREVIOUSLY we have seen that liquids possess no shape of their own, but rather, tend to assume the shape of the containing vessel. This condition is true since the molecules of a fluid at rest are readily displaced by even the slightest force or agitation. This characteristic is designated as "mobility' and varies widely for various kinds of liquids. For instance, an example of extremely high mobility is found in the vaporized gasoline that serves as the combustible medium for the modern aircraft power plant, full size and miniature, which passes readily and with a high velocity through the induction pipes into the engine cylinders.

The factor which tends to influence the mobility of a liquid is its viscosity, which might be termed its resistance to flowing under stress because of the internal molecular friction. We are interested in the mobile properties of a fluid because fluids are used in modern aircraft in a number of ways. For instance, we use oils in shock absorbing elements, the dampening devices of certain instruments, the cooling system of indirectly cooled motors and in many laboratory testing devices. Since the mobility of a fluid may be established as constant at some specified temperature, this property is used in calibration in many instances as a standard to go by.

Just as a high degree of mobility is useful in the case of the gasoline engine fuel, lowered mobility, or the equivalent characteristic of high viscosity, is desired in aircraft engine lubrication oils. This becomes essential in view of the high speed and elevated temperatures encountered by the internal members of aircraft power plants. Viscosity, which may also be termed simply the "body" of oil, varies inversely with temperature. The standard test made to determine the viscosity of an engine oil consists in observing the time required for a specific quantity of the liquid to flow through an orifice of standard size under certain temperature conditions. The device employed for this determination is called a "Viscosimeter" and is illustrated in Figure 1. The central vessel which terminates in the orifice or outlet tube is surrounded by a suitable liquid bath in order to effect a gradual temperature rise in the oil when external heat is applied in the course of the test. This test constitutes one of the most important factors in determining the suitability of an oil for aircraft purposes. For example, when an oil is spoken of as possessing a viscosity of 40 at 100 degree Fahrenheit, this infers that it will require 40 seconds to flow through the viscosimeter orifice. Aviation lubricants have their specifications predicated upon a viscosity tested at 210 degrees Fahrenheit. All-weather aircraft lubrication oils specify viscosities varying from approximately 90 to 95, and, for heavy duty, from 115 to 120.

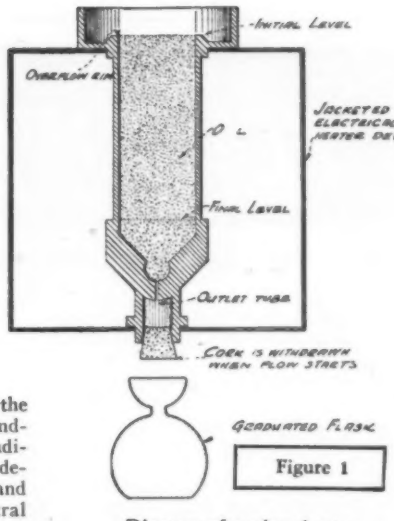


Figure 1

Diagram of a viscosimeter

We all know that bodies immersed in liquids are acted upon by a lifting force equal to the weight of the liquid displaced by the body. This lifting force is termed buoyancy. As a matter of fact, a body upon being immersed, may displace a weight of the liquid, less than, equal to, or greater than, its own weight. In the first case, the upward force becomes less than the weight of the body and the body sinks, as would be the case of a bar of iron. In the second case, the upward force becomes equal to the weight of the body and the body is then said to be in a state of equilibrium. In the third case, the upward force exceeds the weight of the body and the body consequently rises until a sufficient portion of it is out of the liquid so that the two forces become equalized. Thus we see that a body that floats on a liquid will tend to sink to such a depth that the weight of the liquid which is displaced equals the original weight of the body. This is exactly the principle upon which seaplane floats and flying boat hulls are designed. It may be mentioned, that flotation is a direct function of the shape of the body, since the shape is an important factor in the displacement of liquid.

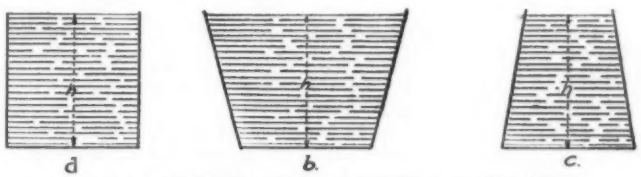


Figure 2. The liquid pressure in vessels of various shapes

The weight represented by a quantity or volume of liquid is sustained by the bottom of the containing vessel. Each unit area of the bottom of the tank or container has a force "p" exerted upon it. This force per unit area is termed the pressure and is proportional to the depth of the liquid and to its density. This relation is given in the equation form as:

$$p = \frac{\text{Weight}}{\text{Area of Base}}$$

For example, compute the force per unit area acting on the bottom of an airplane fuel tank of cylindrical form. The dimensions of the tank include a diameter of 3 feet and a height of 4 feet, the tank being installed with the long dimension arranged vertically. Assume the weight of aviation gasoline to be 46 pounds per cubic foot.

Total force = Height x area x weight per cubic foot

Total force = $4 \times 3.1416 \times (1.5)^2 = 1299.96$ pounds

$$\text{Force per unit area} = \frac{\text{Total Force}}{\text{Area}} = \frac{1299.96}{3.1416 \times (1.5)^2} = 1840 \text{ pounds}$$

The problem of space limitation is one which always confronts the airplane designer. Thus, instead of employing rectangular shaped fuel containers of the type illustrated in Figure 2(a), a designer may be forced to resort to a form of tank in which the sides flare out at the top as in Figure 2(b), or one of the roughly conical form as in Figure 2(c), in order to accommodate an instrument board or

(Continued on page 32)

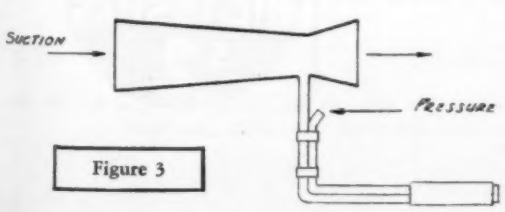


Figure 3

Venturi-Pitot air-speed tube

SPECIAL TO MODEL AIRPLANE NEWS:

GERMANY'S highly touted Messerschmitt mystery twin-engine fighter at last revealed under the press of wartime production. Similar in outline but totally dissimiliar in performance to the older Dornier Do. 17. Top speed: past the four hundred mark with two close-fitting Daimler-Benz 1160 horsepower motors.

Lockhead (12) C-40B light transport for the Army is tricycled. All three wheels fixed with heavily-panted nose wheel. XR40-1 (Model 14) Transport delivered and additional orders for XP-38 (MODEL AIRPLANE NEWS, May 1939) twin-engined fighter. Four-engined model 44 nearing completion.

Seven Vultee V-11SGB seaplane scouts for Sweden with peculiar large fin noted on original model for Russia. Latest is the XBC-5, first radical new design to issue from this plant since the inception of the popular V-11 attack monoplane four years ago.

Two full squadrons of Boeing B-17B four-engined monsters have been assigned to Southern California's March Field with deliveries already under way.

Lost at sea: Alexander Loeb and Richard Decker in tiny lightplane with only 350 gallon gasoline capacity. Attempted flight from St. Peter's, Nova Scotia, to Ireland was undertaken after Floyd Bennett (New York City) airport officials had prevented flight whose ultimate destination was Palestine.

Harlow PJC all-metal lightster has been sold to fifty different customers with deliveries standing at one-a-week.

Ordered by the U.S. Navy: six Douglas DC-5 twin-engined tricycle transports for personnel transfer. The first will be especially adapted for carrier work. Thirty model B-18G twin-engined medium bombers have been sold to the Royal Canadian Air Force with uncertainty looming as Canada declares war on Germany and neutrality act thus involved. Painful would be the loss of France's contract for one hundred fast DB-7 attack-bombers with $500,000 in precision tools, dies and jigs ready for mass production.

Delbert Bush of Leavenworth, Kansas lost his life in a pre-race tuneup crash of his Folkerts "jinx' ship. Only five hundred feet in the air, Bush took to the silk when his motor failed but was trapped in the pit by a faulty hatch.

Screwball 1," light Aeronca monoplane, was grounded at Manchester, N.Y., before Pat Johns could get off on an insane Atlantic attempt. Only 175 gallons capacity!

Ordered by the Army Air Corps: $1,579,338 worth of Fairchild light primary trainers and an additional order to Ryan for PT-16 open-pit trainers.

Big four-engined Junkers Ju. 90 airliner crashed and killed six crew members after faulty take-off from Hanover (Germany) on scheduled London flight.

Navy crashes (one Douglas Torpedo-Bomber, one Consolidated long-range flying boat) claimed the lives of eight crewmen and officers. Fog and low visibility was explained as the causes of the disasters.

The Physics of the Airplane

(Continued from page 31)

to provide additional space for engine accessories.

Assuming that the base area of all three types of fuel tanks has the same value, we might be immediately prone to believe that the pressure acting on each unit area will differ for each individual type of fuel tank. However, this is not the case. The pressure acting on each unit area, for instance, each square inch, on the bottom of the three tanks is the same. Each square inch of the bottom sustains only the column of liquid above it. In the case of tank (b), the extra liquid above the sloping sides is sustained by those sides and does not exert a force on the bottom of the container. It becomes readily obvious that the pressure on the area directly under the top of tank (c) is equivalent to that encountered in the two former cases. The sloping tank walls press down on the liquid contained above the remainder of the base with a force which, when added to the weight of this portion of the liquid, causes the force acting on the bottom of the tank at these points to become equal to the force exerted on each square inch directly beneath the top of the tank. The pressure acting on the bottom of a tank or other container becomes absolutely independent of the shape of the container.

In a liquid at rest, the pressure existing at all points at the same level in connecting vessels is maintained at a constant value. However, in a moving fluid, the pressure existing at two points at the same level might assume a wide variation in values. In the case, for instance, of liquids flowing through pipes such as found in the fuel and lubricating system of aircraft engines, the internal friction between the various layers of the fluid tends to effect a marked decrease in the total pressure exerted by the fluid, particularly as the distance from the source

(Continued on page 67)

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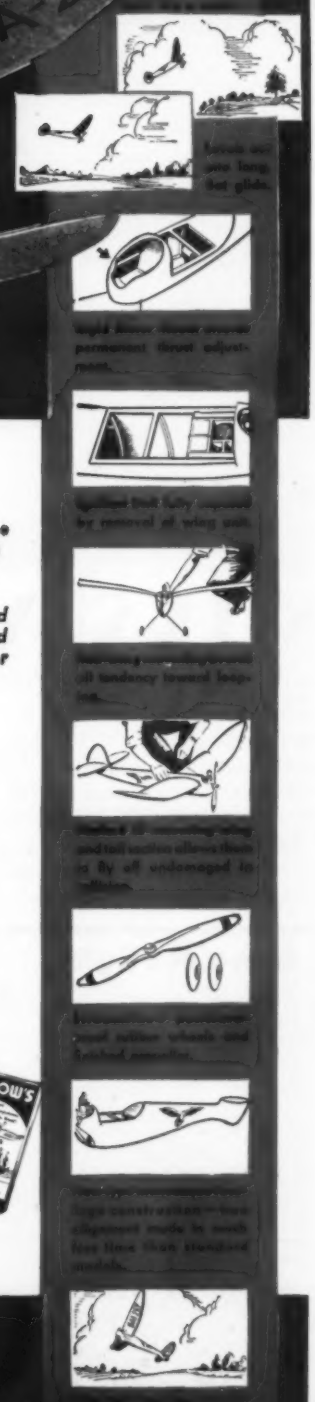

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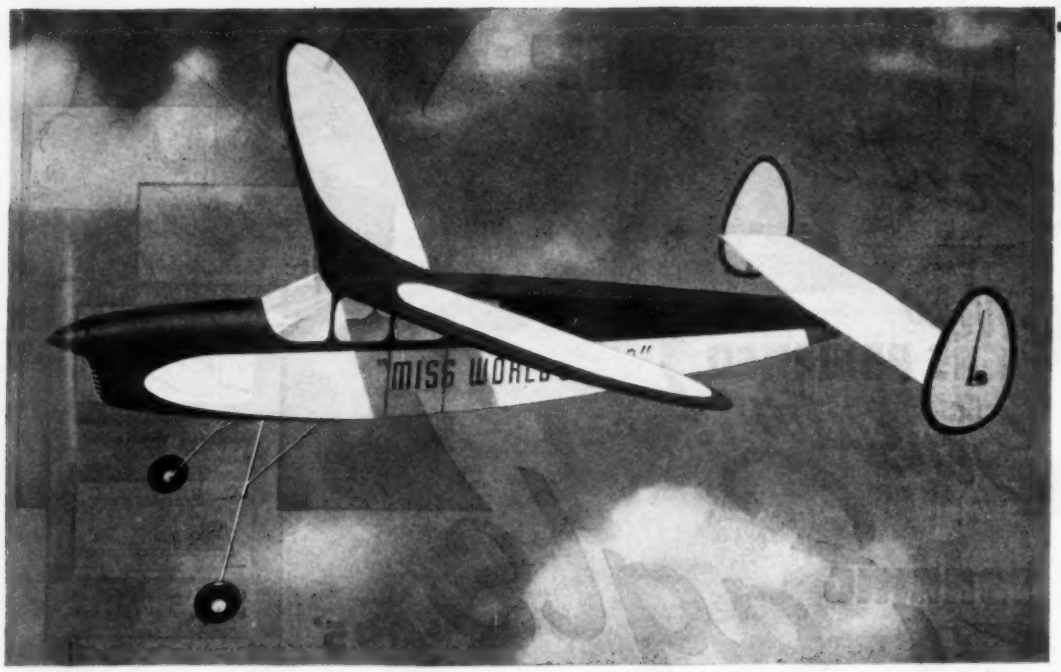

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Just as the New York World's Fair is breaking records for awe-inspiring achievement, so is SCIENTIFIC'S "MISS WORLD'S FAIR" breaking records for popularity in the model airplane world. The reason is indeed simple. Designed primarily for flying, she contains many popular aerodynamic features. Her high aspect-ratio, swept back wing provides fast climb and a long flat glide while her twin rudders assure greater spiral stability. The "MISS WORLD'S FAIR" is easy to build. The longerons of her graceful, square fuselage contain no sharp curves that would be hard to form and to cover. Capable of flights of over ½ mile this new model has won the fancy of model builders everywhere for it is the kind of a ship that can be built in a hurry and with a minimum of effort and with which you can have a lot of fun flying after it has been completed. Wingspan 30"; length 20". Kit is complete with full size plan. Obtainable at your dealer **50c**

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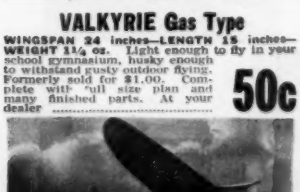

"Miss America" Gas Type

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Gentlemen:

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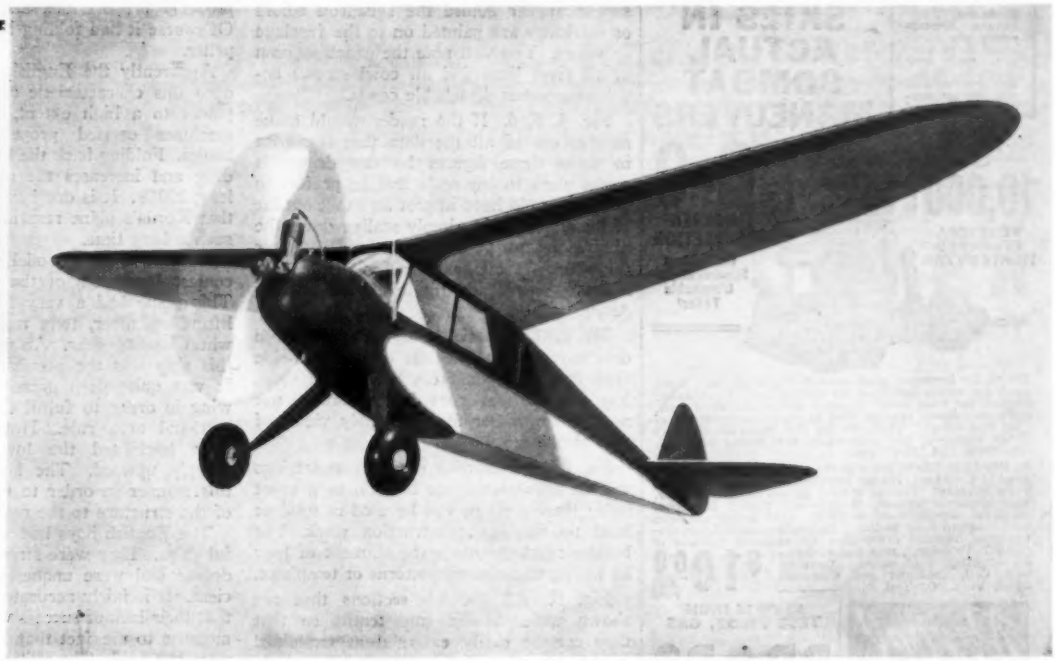

THE MERCURY

Designed especially for you model builders who want a high performance contest gas model that will also be able to "take it," the SCIENTIFIC MERCURY more than meets all expectations. The pound thrust of the average 1/5 H.P. engine exceeds the total weight of the ship and her flight characteristics make it possible for her to hang on her prop and climb straight up with no tendency to loop! A slow roll after the motor cuts brings her out on top as she starts her long flat glide to earth. The stress analyzed structure of this new model enables her to withstand excessive flight loads as well as those imposed by hard landings. A few of the many features to be found on the MERCURY are: staggered tail surfaces, as protection against spinning; a tapered wing, for greater flying efficiency; and a reinforced front end for the nose of a successful gas model must be able to withstand not only severe motor vibration but also the impact of landing.

The full size illustrated plan of the MERCURY makes her easy to build too. What else could you ask for in a gas model?

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MERCURY DELUXE KIT . . . for a little more, SCIENTIFIC offers everything the same as above, plus the addition of yellow blue and gold SCIENTIFIC dope and a pair of 3½" pneumatic rubber wheels (in place of balsa-wheels). A real big $10.00 value for only.....

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20" Wingspan. She flies with the greatest of ease . . . Just wind her up and she is ready to go . . . her tail lifts . . . she gathers speed . . . space does not permit an explanation of the Yankee's many features . . . but go to your dealer and look it over for yourself and be convinced that it is the greatest value of all times.

25c

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Scientific's old reliable. Has 50" wingspan, over all length 34". It conforms with the N.A.A. contest requirements and boasts of many cups won from Maine to California. Built for endurance and speed. Kit is 100% complete. The Oriole is so easy to build that even the beginner will turn out a masterful job, following the simplified plan. Of course your dealer has it.

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WINGSPAN 36"—LENGTH 28"—FLIES MILE. A more streamlined gas type model capable of many fine flights. Looks and sounds like a real gas job. Kit 100% complete including M & M pneumatic wheels. At your dealer

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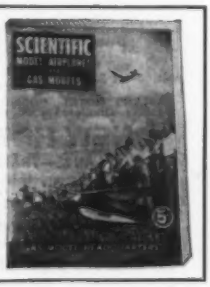
Your dealer has ready for distribution, SCIENTIFIC'S new big 1940 catalog. Get your copy today. You will find a full list of kits and supplies including motors, balsa, wheels, gas model hardware, electrical fittings, propellers, radio control, race cars, speed boats, launches, rubber, etc. Price 5c.



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12"-12½"-13"-13½" 14"-14½"-15"-15½"-16"

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Same Size or Assorted

'TRU' DETAIL PAULOWNIA SCALE MODELS

12¼" wingspan FAIREY HENDON

Accurate, sturdy scale model of Britain's Great Bomber! This complete kit includes everything! Makes a beautiful, permanent model.

13½" wingspan NIGHT BOMBER

French Braquet 27A2 Type. A complete kit, nothing else to buy. Build this interesting and timely show plane!

THESE ARE NOT Fragile Balsa Models

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Both these kits include partially finished Fuselage, Wings of PAULOWNIA WOOD—not balsa.

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Partially finished tail Surfaces. Propeller, Wings and Wheels. Full Size Blue-prints and instructions.

7 Rust-resistant, easily sharpened, interchangeable Cutters

"Studiette"

COMPLETE OUTFIT 50c

International introduces this sensational 7-in-1 cutter for Model Airplane, Ship-making and Craft work. A perfect tool for Balsa and similar surfaces. England's Finest Sheffield Steel. Hand ground and sharpened. Includes: General Purpose (accurate angling); Diamond-Point Parting; Rebate Cutter; "V" Groove Veiner; Forward-Cut Gouge; Back-Cut Gouge; Square-Cut Gouge and Special "Kantslip" Holder. Additional blades only 3 for 25c.

DEALERS NOTE: "Studiette" is attractively packed in 2 pieces, simulated wood, individual carton.

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INTERNATIONAL MODELS

254 West 55th St., Dept. M, New York City

A Miniature Douglas O-46A

(Continued from page 13)

should appear before the squadron colors or markings are painted on to the fuselage or wings. You will note the exact position of all rivet lines and all cowl screws besides numerous detachable cowls.

Fig. 4, 5, 6. If the reader would make careful use of all the data that is shown in these three figures he can draw his model plans to any scale that he prefers to use and would have almost an exact outline of the airplane; by simply scaling down the dimensions to your chosen scale. After the plans are all drawn refer to the final assembly views and fill in all the missing detail.

Fig. 7. The special bottom view has been drawn so that all details on the left-side view is understood from the bottom view. You will see numerous details that are not seen on any other final assembly views of this airplane.

Fig. 8. The drawing of all cross sections will be appreciated, we believe, as a great help; these sections can be used in solid or built up fuselage construction work. The builder must use his best judgment of how he wishes to make his patterns or templates.

Fig. 9. All the rib sections that are shown were divided into tenths so that they can be easily enlarged as explained in the article on the Vought "SBU-1." If the modeler wishes to build his model to a ¾" scale he must enlarge the ribs by four (4) times. First you must draw the section's center line, then lay out the width of the rib and the height above and below the centerline. Divide the rib into ten segments and draw lines at right angles to the center lines which will represent each tenth's line. Spread your dividers to the distance on the first tenth's line from the center line to the curve of the rib above the center line, multiply this distance four times on the first tenth's line of your rib plan and place the point in its respective location. Repeat the procedure in spreading your dividers to the distance below the center line on the first tenth's line to the curve of the lower rib's surface and multiply this distance by four times and placing the point in its respective location below your rib's center line on the first tenth's line. By studying this procedure over and over, you will easily grasp the method of enlarging the ribs with the least amount of time. This method is fairly accurate for scale model work.

N.A.A. Model Airplane News

(Continued from page 29)

be out of place.

Korda's model was of the design which he usually follows in his contest work. The fuselage was a built-up frame covered with paper, and the cabin with windows made it look very realistic. The wing had a polyhydral shape and employed an airfoil designed by Korda. He prefers the type of airfoil with a concave undersurface, as this enhances the soaring ability of his models. A large cambered stabilizer gave it very unusual stability. It was of the orthodox type with the two wheel landing gear and was not freakish in any sense, which goes to prove that even if a model is of common design its flight is not impaired if it is properly proportioned and cleverly flown. Of course it had folding blades to the propeller.

Apparently the English have not developed this characteristic of blades on their planes to a high extent, for all of their machines carried propellers with rigid blades. Folding back the blades reduces the drag and increases the angle of glide at least 100%. It is due largely to this factor that Korda's plane remained in the air for such a long time.

Another unusual model was flown at the contest by Baker of the American team. This plane had a very high aspect ratio, lifting stabilizer, twin rudders and a one-wheel landing gear. An unusual feature of this ship was the peculiarly shaped body. It was quite deep immediately under the wing in order to fulfill the fuselage cross sectional area rule. However, from this point backward the lower edge curved sharply upward. The body was built in this manner in order to reduce the weight of the structure to the rear of the wing.

The English boys had some very beautiful ships. They were streamlined to a high degree and were unquestionably very efficient. It is fairly accurate to say, however, that their lack of success was due in a large measure to the fact that folding propellers were not used. The philosophy back of the design of the English planes was that they believed the contest could be won without the aid of thermals; they depended upon the actual performance of the ship under power rather than upon its soaring capacities.

Some very beautiful ships were entered from South Africa and New Zealand, some of which are shown in the pictures. Evidently the South African boys are very progressive, inasmuch as their planes were equipped with folding props.

Our old friend, Harry York, again graced the contest with his presence—he was in America with the English team two years ago. The international record holder, Copeland, also came to America on the English team for the second time.

Apparently this international contest was a social event as well as a flying one, for the visiting teams were wined and dined in a most elaborate fashion. Upon their arrival, MODEL AIRPLANE NEWS gave a luncheon so that all of the contestants might become acquainted and a spirit of fellowship might prevail throughout their visit to America. Next month a second series of pictures on the Wakefield Competition will be shown. This will illustrate the many activities which took place outside of the actual contest; including a visit to the New York World's Fair, the Kresge luncheon, trip on the Goodyear blimp and TWA plane, as well as many other interesting events.

It is our sincere hope that world conditions will not prevent the fraternity of model builders from getting together again next year at the Wakefield contest which will be held in this country.

As the result of the Lord Wakefield Cup being won by an American for the second year in succession, builders throughout the United States are becoming most interested in Wakefield models.

One example of the many meets for "Wakefield" ships which are to be held

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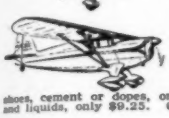

C-D Rearwin Speedster GP-69

64½" gas model kit, for ⅝" or larger motors, contents same as Stinson (excepting turned parts). Without wheels, shoes, cement or dopes, only $4.85. Wet Kit with wheels, shoes and liquids, only $9.25. Complete Kit $11.90. Power unit extra.

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Redesigned with modified landing "2 leg" gear already formed. Has adjustable wing with 2 diff. sections, flat or cambered undersurface and stabilizer optional, flat or lifting surface; name plate for the fin, with space for your name and address in case the model is lost, incorporated right within the design. Span of 50", length 31". Kit contains all necessary balsa, everything needed printed out, with full size C-D drawings, colored tissue, wood and tissue cements, balsa wheels, celluloid, shaped leading edge, nuts, bolts, washers, etc., absolutely everything except the complete power unit itself.

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71½" Chester's (Jeep)	11.95
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76" Howard D.G.A.-8	$12.50
78" Luscombe Phantom	13.95

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All motors listed are ready to run, prop, prop nut, and include gas tank, coil and condenser.

Syncro "ACE" Special	9.95
Gwin Aero	12.00
Syncro "BEE"	12.50
Syncro "ACE"	13.75
Dennymite Standard	15.85
Brown Jr. Model C	18.50
Dennymite De Luxe	17.85

Austin Timer ⅛ oz. $1.25

Smith Firecracker Coil $2.50
Battery Box Pen Cell and 1" Diameter, each 40c
1¼ size, each 50c
Champion Plugs ¼-32 or ⅛-24, each 65c

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Complete Dry Kit D-61 (Span 16") 85c

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Complete Dry Kit SF-60 (Span 21") $2.25
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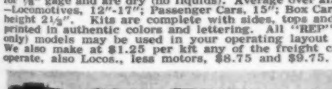

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	BOX CARS		
RB-1	NYC—40 ft. steel	.10	
RB-2	B&O—40 ft. steel	.10	
RB-3	B&O—40 ft. wood	.10	
RB-4	Rock. Is. 40' wood	.10	
RB-5	Wabash—40' wood	.10	
RB-6	SP 40' wood furn.	.10	
RB-8	T&P 40' wood auto	.10	
RB-9	AT&SF 40' wood	.10	
RB-11	U.P.—50' steel	.10	
RB-12	AT&SF 50' auto	.10	
	HOPPER CARS		
RH-1	CCC&StL RR	.10	
RH-2	Missouri Pac. RR	.10	
RH-3	Southern Railroad	.10	
RH-4	Illinois Central RR	.10	
	CABOOSE		
RC-1	PRR type N-5	.10	
	FLAT CARS		
RF-1	C&NW 46' 50 ton	.10	
RF-2	PRR 46' 50 ton	.10	
RF-3	B&M 46' 55 ton	.10	
RF-4	L&N 46' 50 ton	.10	
	GONDOLA CARS		
RG-1	L&N 41' 50 ton	.10	
RG-2	NYC 41' 50 ton	.10	
RG-3	MC 41' 55 ton	.10	
RG-4	T&P 41' 55 ton	.10	
	8000 GAL. TANK CARS		
RT-1	Texaco—TCX (wh.)	.10	
RT-2	NATX (black)	.10	
RT-3	Sinclair—SDRY	.10	
RT-4	Gulf—CROX (blk.)	.10	

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Cleveland's super catalog contains among many other things the following: Wide variety of gas models. Largest assortment of fine rubber-driven model airplanes the world has ever seen in three different sizes to fit all purses. Miniature racing cars in an assortment from 10c authentic Indianapolis winners to models actually driven by gasoline engines. Supplies—all sizes of strip and sheet pine and balsa wood, wheels, cements, colors, special wood parts, metal parts, propellers; and for gas models a wide variety of gas engines, timers, battery holders, starters, spark plugs, coils, switches. Gasoline driven speed boats. Model yachts. Old time sailing ships. Modern war ships. Merchant vessels. Fittings of every imaginable type and size at all prices. Miniature trains of all sizes—and since we are specializing in C-D and HO we have a tremendous variety of kits and parts for these most popular gages. Tremendous assortment of fine rotary cutting tools and grinders, knives, fine drills and taps. All the hard-to-get sizes of wires, tubing, sheet angle and rod materials in various metals, small screws, nuts, bolts and special fittings. Wide assortment of books and drawings. Truly this catalog for all modelbuilders containing many thousands of items will be a revelation to modelbuilders who have never seen it before, for it is larger in number of articles than any dozen other American modelmaking catalogs put together. **You simply can't do without it.** Other in demand items we list are: camdid and folding cameras and all necessary sundries, supplies, etc., finished archery equipment, sets, and supplies for the beginner; also handbooks, microscopes, telescopes, field glasses (for chasing models), etc., etc. No modelbuilder can afford being without this "catalog of catalogs"—don't delay having it—get it right now. No Free Copies.

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is one in the Greater New York area which is scheduled to be run off by the Metropolitan Model League. The M.M.L., you'll remember, is the group which cooperated with MODEL AIRPLANE NEWS is sponsoring the '39 Eastern States Gas Model Championship contest at Hadley Field last August.

Contest directors have come to accept the Wakefield type of model aircraft as the best possible training plane for advanced rubber model building. A rubber-powered model which must weigh half a pound and have a wing area of 200 square inches is no small matter—either in design, construction or flight. For this very reason, those who direct the model aviation activity in America are welcoming the ever-growing interest in the Wakefield model; undoubtedly many meets for these craft will be held in the early months of 1940.

Contests Comin' Up!

October 1, 1939—Pittsburgh, Pa.
Tri-State modelplane championships at "Model Wings" flying field. Gas and rubber events; merchandise prizes. Write M. J. Thomas, 246 Morrison Drive, Pittsburgh.

October 1, 1939—Detroit, Mich.
Outdoor gas competition at Northwestern and 9-mile road. Classes A, B and C. Arthur Vhay, director—Department of Recreation, Detroit. Ask for details on "Detroit's Fall Gas Contest."

October 7, 1939—South Plainfield, N.J.
Second annual meet conducted by Queen City Gas Model Club at Hadley Field. Trophy and merchandise. Write: W. E. Marienschek, 1800 Myrtle Ave., Plainfield, N.J.

October 8, 1939—New Haven, Conn.
Gas model contest at municipal airport with merchandise prizes. Write: Salvatore Russo, 666 Main St., East Haven, Conn.

October 14-15, 1939—Akron, Ohio
Glider, gas and rubber meet at municipal airport sponsored by Women's N.A.A. Chapter. To be directed by H. M. Jellison; write to Miss Frances Alexander, 729 W. Market Street, Akron.

1939-1940—Boston, Mass.
Bi-monthly indoor and outdoor contests held by Jordan Marsh, Boston Traveler Junior Aviation League. For full information write J.A.L. Director, Jordan Marsh Co., Boston.

1939-1940—National Aero Reserve meets will be conducted throughout the East according to N.A.A. rules. For full information concerning where and when, write Lt. J. L. Scherer, N.A.R., Rochester Airport, Rochester, N.Y.

A Word of Credit

In the rush that always follows the National Contest it sometimes happens that some individuals or groups are left out of the "credit column" when reports of the competition are prepared. Fortunately, there are so many grand persons associated with the model airplane activity that it is possible to slight the efforts of some and never a murmur of protest will arise.

However, there is one grand group of gals whose work we'd like to acknowledge right here and now. If you were a participant in the 12th National battle you'll remember those fine first-aid workers who labored so continuously to apply soothing balms to sun-seared builders as well as tape up prop-nicked fingers. Well, folks, those lovely nurses were members of the Aerial Nurse Corps of America, with Miss Leora B. Stroup, R.N., of Detroit in charge. The A.N.C. is an affiliated N.A.A. senior chapter with headquarters in California and branches and members throughout the United States.

If You Missed the Mississippi

Here's a first hand account of one of America's largest annual model aircraft competitions—the Mississippi Valley Model Airplane Meet which was held this year in St. Louis, Mo., on August 12 and 13.

Co-sponsored by the Young Men's Division of the St. Louis Chamber of Commerce, Meramec Airport and Stix, Baer & Fuller, the contest manager was genial H. T. "Bob" Sommers, Academy of Model Aeronautics members from St. Louis and general all-round grand guy.

In the indoor and outdoor battle eight national records were believed to have been bettered by the contestants, who came from 20 states and participated on Sunday, the 13th, at Meramec Airport before an audience of 10,000 persons.

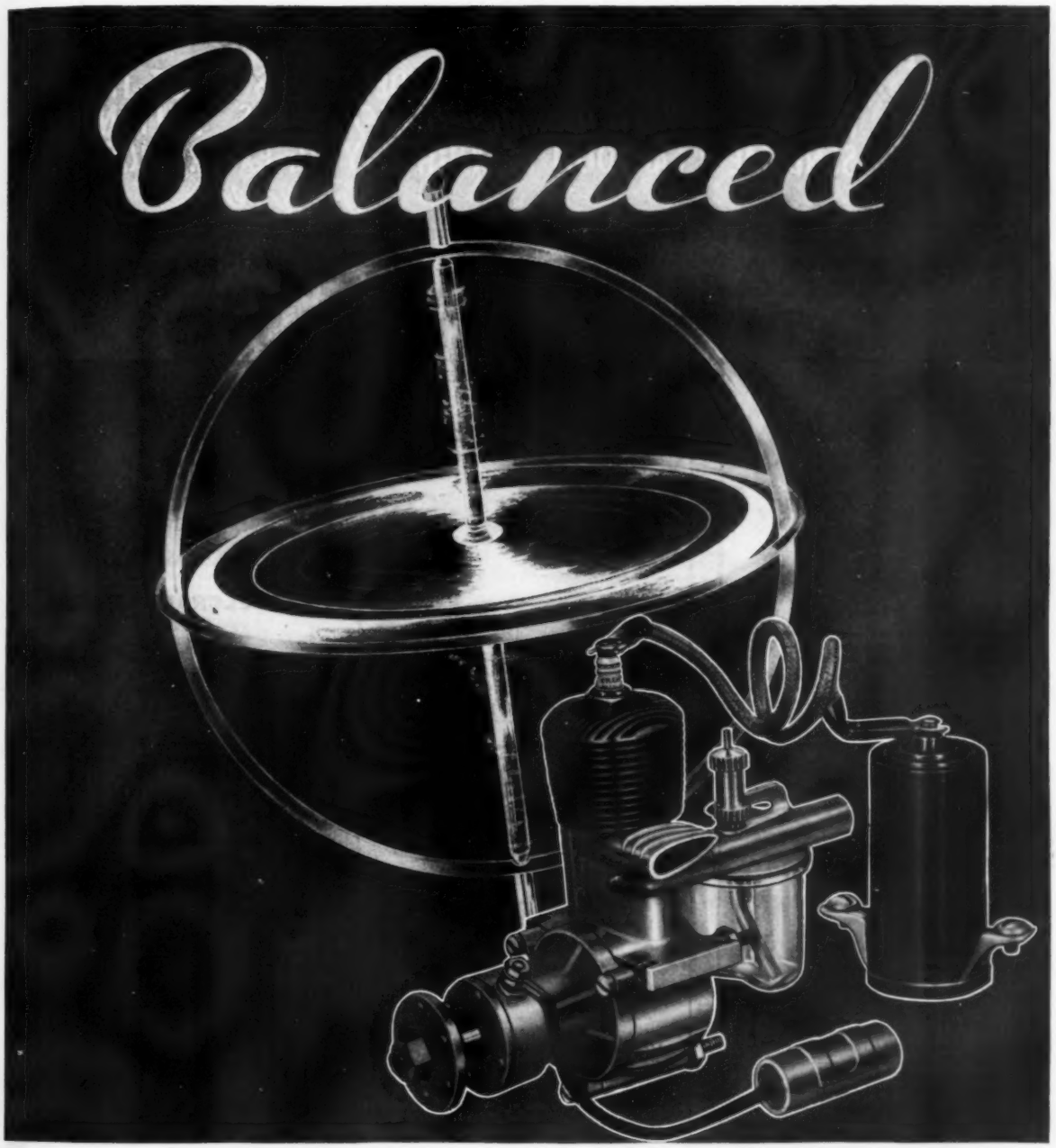
To top off matters, in addition to having ideal weather conditions, the modelers had prizes galore to fight for; there were handsome plaques for those who had good flights but didn't land among the top place entrants in one of the 10 events.

Of unusual interest was the new Helicopter Event which attracted quite a number of entries. George Lambros, a St. Louis boy and a member of the Stix, Baer & Fuller Model Airplane Club, won it with a strange-looking model that looked rather like a baby's toy than a model airplane. All models eligible for this event had to operate on the helicopter principle. The model must weigh, ready-to-fly, at least 1½ oz. for each 50 square inches of surface on vanes. The models could be handlaunched and the winners were selected on duration of flight. Lambros' model stayed in the air for 59.7 seconds, with a 3-flight average of 47.3 seconds.

Results of the meet appear on page 42. Publicity Director Hanns Kolmar doubled last year's space in the newspapers, giving the meet approximately 6,000 lines and a wealth of photographs. Radio stations cooperated in a splendid way, and Universal made a newsreel of the outdoor meet. Congratulatory messages were received from Bobby Breen, Hollywood movie star, and Jimmie Mattern, the famous aviator, who are both honorary members of the Stix, Baer & Fuller Model Airplane Club.

As last year, prizes were awarded at a banquet Sunday night by a St. Louis actress. Speakers at the banquet included Major E. H. Lauth of the Missouri National Guards; Major Ralph Page, and Wm. Aurien, assistant operations officer at Chicago & Southern Airlines.

(Continued on page 42)



Symbol of PERFECT BALANCE IN MOTION is the gyroscope. When you read that Ohlsson 23 ran 400 consecutive hours—equivalent to *12 years* of normal flying—it means that Ohlsson 23's crankshaft, connecting rod, and piston are in as perfect dynamic balance as it is possible to achieve today. Any *off-balance* in these vital parts means loss of power, increased vibration, shortened motor life.

THERE'S ALWAYS ONE LEADER—
THE NATIONAL CHAMPION!

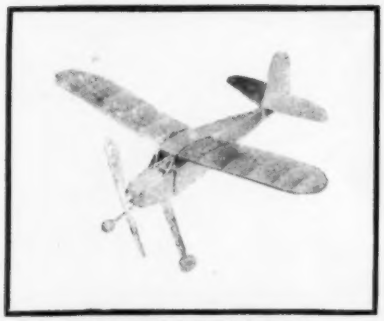
Ohlsson
Miniatures
3340 EMERY STREET
LOS ANGELES, CALIF.

Get the "VIBRATION-LESS POWER"
of the National Champion

Out of a field of 650 contestants, *twenty Ohlsson 23's* powered the ships taking the FIRST TEN PLACES in both the Class B (.20 to .30 cu. in.) and Class B Open Event in the National Championships at Detroit, the cleanest sweep ever made by one make of motor! Get this "Vibrationless Power" for your ship. See the difference in quicker starting—the ease with which Ohlsson 23 maintains its higher wide-open speed. There's real music for a model builder's ears—the roar of a *balanced* Ohlsson 23—waiting at your dealer's. Price, only $16.50 complete. For specifications, write direct to the new Ohlsson Miniatures plant.

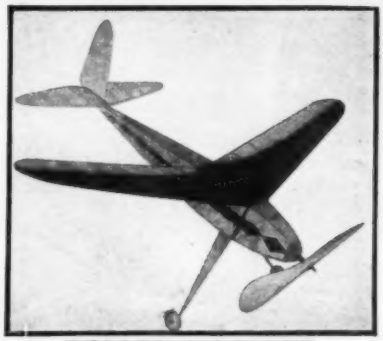
SAY FELLOWS:
HERE IS HOW ONE MODEL BUILDER FEELS ABOUT THE FLYING ABILITY OF OUR *MODELCRAFT* SHIPS. WHY NOT SEND ME A CARTOON OF YOUR FLYING EXPERIENCE.
Barney

MODELCRAFT "TOP NOTCH" RUBBER POWERED MODELS



30 in. PACIFIC ACE

A practical and durable commercial model. Easily constructed from well drawn and detailed plans. Kit contains an ample supply of first grade wood and high quality cement. Comparable with and outflies most dollar kits.
Add 10c for Postage..... 25c



RECORD WRECKER

Newest Modelcraft Sensation! With a 26" span the Record Wrecker includes freewheeling unit, rubber lube, contest rubber, best quality balsa, cement, dope and large full size plans.
Add 10c for postage..... 50c

MODELCRAFT SOARING GLIDER

(Towline Glider)

31½" Soaring Glider has turned in many flights of better than one hour. Kit complete. **Add 10c Postage..... 25c**

CLOUD HAUNTER

40 in. model, same ship as Pacific Ace, add 10c postage..... 50c

W. R. Butterfield of Los Angeles made a flight of 2 hours and 40 min. with his Cloud Haunter.

MODELCRAFT MOTORS

BROWN

Model "D" $12.50 Post Paid
Model "C" $18.50 Post Paid
Model "B" $21.50 Post Paid
Model "M" $16.50 Post Paid

OHLSSON

MODEL "23"

Choke-full of power, speed and stamina!

SPECIFICATIONS

Horsepower 1/7. Bore 5/8", Stroke 5/8". Bare weight 4 1/2 ozs., Height 3 9/16"..... $16.50 Post Paid

TORPEDO

Displacement .30 cu. in. 1/5 H. P. 8,000 r.p.m. with 12 in. prop.... $16.50 Post Paid

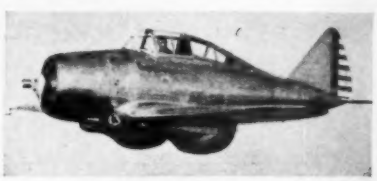
HI-SPEED

1/7 H.P. 6500 R.P.M. Weight bare 3½ oz. Runs upright or inverted; fully assembled, complete with coil and condenser.

$12.75 POSTPAID

40" FLYING MODELS

AERONCA Low Wing (pictured) and REARWIN Speedster
Kit 50c plus 10c postage

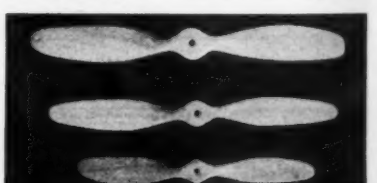


SEVERSKY P 35

This ship is said to do over 300 m.p.h. Kit has turned cowl, hard wood prop, cement dope, trim color, and easy to follow plans. You will like this ship. Wing span 24 inches.
Add 10c Postage..... $1.00

NORTHROP A 17

This high speed attack plane is known to all interested in planes. 24" accurate model. Detailed plans make building easy. Kit has turned cowl, cement dope, trim color, hard wood prop, and balsa.
Add 10c Postage..... $1.00

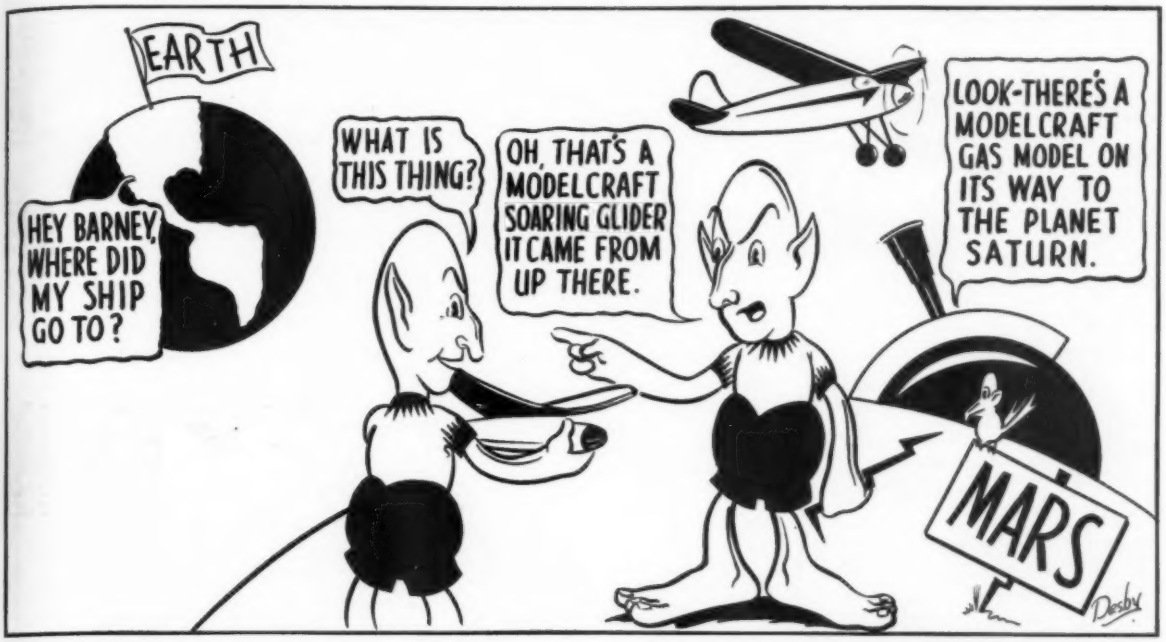


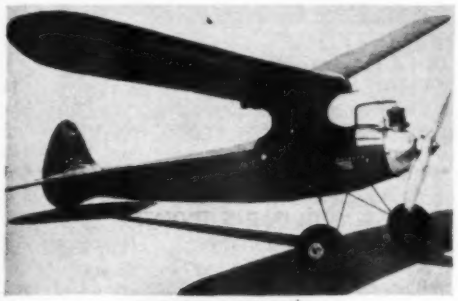
GAS MODEL PROPS

Modelcraft gas model props have the reputation for being the finest and most efficient in the country. Stock up NOW —carry plenty of extras in your tool box. Complete range of sizes, 9", 10", 11", 12", 13", 13½", 14" each..... **25c**

★ MODELCRAFT ★

THE LEADING SUPPLY HOUSE OF THE WEST ★ 7306 SOUTH VERMONT AVENUE, LOS ANGELES, CALIF

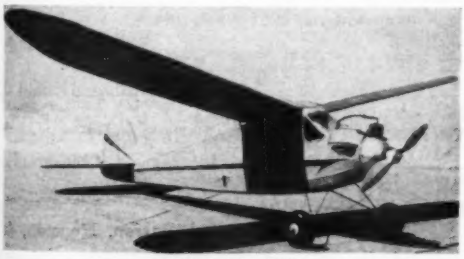

EARTH
HEY BARNEY, WHERE DID MY SHIP GO TO?
WHAT IS THIS THING?
OH, THAT'S A MODELCRAFT SOARING GLIDER IT CAME FROM UP THERE.
LOOK-THERE'S A MODELCRAFT GAS MODEL ON ITS WAY TO THE PLANET SATURN.
MARS
Desby



INTERCEPTOR

Wing Span 46", chord 7", flying weight 23 ozs. *Kit contains:* formed landing gear, beveled trailing edge, spun aluminum cowl, printed balsa parts, extra select gas model balsa, full size detailed plans showing both radial and beam type mounts, plenty of bamboo paper, cement, dope, complete test flight instructions and *gas model air wheels.* Kit..... **$2.95** POST PAID

PLANS ONLY..... 25c



SKY BABY

15¼ minutes on a 12 second engine run. Performance like this speaks louder than words. 'Nuff said.

FLYING WEIGHT WITH OHLSSON "23"—27 ozs. Wing span 54"—Wing area 360 sq. inches. KIT CONTAINS spun aluminum cowl, air wheels, cement, dope, formed landing gear, colored gas model paper, printed ribs, select balsa, enlarged full size plans..... **$3.85**

PLANS ONLY..... 25c

MISS TINY WINS!

1st, 2nd, 3rd at Pomona, California. (First 20 second engine run contest) **1st at Honolulu, T. H.—1st at Sunnyvale, California—1st at Finley, Ohio**—2nd at *Detroit, 1939 Nationals.* A pocket edition of the Pacific Ace, 46" constant chord wing. For Ohlsson 23, Phantom and other ⅝" engines. Wing span, 46". *DeLuxe Kit* contains spun cowl, silk, 2½" Voit Air Wheels, cement, dope, die-cut ribs, plenty of good balsa, and full size plans. Price..... **$3.95**

STANDARD KIT same, but with bamboo paper covering..... **2.95**

DRY KIT complete except for wheels, covering, cement and dope..... **1.95**

PLANS ONLY..... 25c

1939 PACIFIC ACE GAS MODEL

66 in. tapered wing. DE LUXE KIT contains tapered spars, beveled and tapered trailing edge, die-cut ribs, turned aluminum cowl, 1 qt. gas dope, 1 pt. cement, 3½ yds. super silk, formed landing gear, 4½ in. inflatable air wheels, dural wire, alum. tube, washers, bolts, haskalite, dural sheet, hook up wire, switch, selected hard balsa, full sized, black and white, plans with test flight instructions, complete..... **$8.50**

STANDARD KIT with bamboo paper, ½ pt. of dope, 1 pt. of cement and 3½ in. air wheels..... **6.25**

DRY KIT same as above without cement, dope, silk or wheels..... **4.75**

PLANS ONLY..... 50c

★ MODELCRAFT ★

THE LEADING SUPPLY HOUSE OF THE WEST ★ 7306 SOUTH VERMONT AVENUE, LOS ANGELES, CALIF.

. . . For Tops in MODELS . . .

BUILD & FLY THESE RECORD BREAKERS

NEW HEATHE $1.00 FLYERS

Each kit complete with all necessary parts; with Aluminum Cowl, Carved Prop. Full size plans. Colored Paper and parts to spare. All parts printed on balsa. Easy to assemble, easy to fly. The most for your money in a dollar kit.

$1.00 each post-paid

Pick Yours From This List

50" HOWARD DGA8 — 54" FAIRCHILD
50" RYAN ST — "RANGER"
54" FLYING CLOUD — 60" MR. MULLIGAN
54" MILES MOHAWK — 60" MONOCOUPE
54" THE "CUB" — 54" STINSON SR-9

RUBBER MODEL SUPPLIES

18" BALSA
1/16x1/16, 100—5c
1/16x1/8, 35—5c
1/16x3/16, 18—5c
3/32x3/32, 30—5c
1/8x1/8 30—5c
1/8x1/4 10—5c
3/16x3/16 8—5c
1/4x1/4 6—5c
1/4x1/2 3—5c

18" SHEETS
1/64x2 4—10c
1/32x2 8—10c
1/16x2 8—10c
3/32x2 7—10c
1/8x2 6—10c
3/16x2 5— 9c
1/4x2 3—10c
3" sheets or 36" lengths, double above prices; add 10c for package charge for 36" lengths.

PROP BLOCKS
1/2x3/4x6 6—5c
5/8x1x8 3—5c
3/4x1 1/4x10 3c ea.
2 1/4x11 1/2x12 2c ea.

WASHERS
1 doz. 1/8 or 1/4 1c

18" PLANKS
1x1 5c; 1 1/2x2 6c
1x1 1/2 9c; 1x2 10c
1x3 15c; 2x2 18c
2x3 23c; 2x6 39c
3x3 40c; 3x6 75c

BAMBOO
1/16 sq.x14 35 for 5c
1/16x1/4x11 1 doz. for 8c

COLORLESS CEMENT
1 oz. 5c; 2 oz. 9c
4 oz. 16c;
1 pt. 50c
Clear dope, banana oil, thinner, same price as cement.

COLORED DOPE
White, yellow, orange, blue, red, green, olive drab, black, silver, gold or gray.
1 oz. 6; 2 oz. 10
4 oz. 19; 1 pt. 65

HIGH GLOSS
1 oz. 9c;
2 oz. 16c
4 oz. for 28c

RUBBER-LUBE MICRO-FILM WOOD-FILLER
1 oz. 10 2 oz. 15

WHEELS per pr.

	Birch	Bass	Balsa
1/4"	.01	.03	
3/8"	.02	.04	.05
1"	.03	.05	.07
1 3/8"	.04	.08	.10
1 7/8"	.07	.10	.16
3"	.15	.15	.30

SILVER TISSUE
1 sheet..... .05

TISSUE, AA
All col., doz. 10c
Superfine, white, 1 doz. 15c

ALUM. TUBING
1/16, 3/32, 1/8, 1 ft.. 7c
3/16, 1/4, 1 ft. 10c

PROPELLERS

	Balsa	Paulownia
Mach Cut		
5"— 4c		8c
6"— 5c		8c
7"— 6c		9c
8"— 7c		12c
9"— 8c		13c
10"— 8c		17c
12"—10c		22c
14"—14c		
15"—15c		35c

RUBBER
.045, 25 ft. 5c
1/16 sq. 15 ft. 5c
1/8 flat 15 ft. 5c
Skein for 50c
3/16, 10 ft. 5c

THRUST BEARINGS
Small, 1 doz. 10c
Large, 1 doz. 15c

CELLULOID MOTORS
1 1/2"—1 for.. .10
2"—1 for..... .15
2 1/2"—1 for... .20
3"—1 for..... .20

HEATHE RECOMMENDED MOTORS

DOUBLE GUARANTEE against defects in material or workmanship on Motors bought from HEATHE. Factory guarantee and Heathe guarantee . . .

BROWN Jr. Motors

	Postpaid		Postpaid
Model "D"	$12.50	Model "B"	$21.50
Model "C"	$16.50	Model "M"	$15.00

SYNCRO BEE—¼ H.P. (Ideal for small flying models)..... $12.50
SYNCHRO SPECIAL, ½ H.P.. $ 9.95
SYNCRO ACE, ⅓ H.P..... $13.75
HUSKY, JR..... $12.50
RANGER, Class B..... $21.50

TRADE-IN DEPT.
Send us your old motor; and name of new motor you want. We'll air-mail appraisal. Motor returned at our expense if offer not satisfactory.

HOW TO ORDER
Add 15c for packing and postage on ALL supply orders up to $1.50. On orders of $1.51 or over, add 10% of the total for packing and postage.

GAS MODEL SUPPLY CATALOG
GAS MODEL supplies, kits and motors at LOWEST PRICES. Send for your copy NOW!

Authorized distributors: Heathe carries all the leading makes of motors, kits, accessories and replacement parts in stock. We can supply you at regular factory prices backed up by the Heathe guarantee—Brown Jr. Motors, "O. K." Engines, Husky, Jr., Ohlsson Motors, Syncro Motors and Race Cars, etc.

HEATHE MODEL AIRPLANE CO.
250 Troy Ave., Dept. B11, BROOKLYN, N.Y.

Valuable premium Coupon with all orders.

OPEN CLASS INDOOR STICK EVENT

1.—CURTIS JANKE	SHEBOYGAN, WISCONSIN	18:51.7
2.—Joseph Matulis	Chicago, Illinois	18:00.3
3.—James Cahill	Indianapolis, Indiana	14:28.6
4.—Roy Wriston	Tulsa, Oklahoma	7:12.8
5.—Herman Plegge, Jr.	St. Louis, Missouri	4:44.8
6.—Ralph Kummer	St. Louis, Missouri	4:28.5

SENIOR CLASS INDOOR STICK

1.—MILTON HUGUELOT	CHICAGO, ILLINOIS	17:33.7
2.—Bob Christie	Tulsa, Oklahoma	15:09.8
3.—Donald Dodd	St. Louis, Missouri	11:27.6
4.—Chester Plegge	St. Louis, Missouri	3:06.1
5.—James McLeery	St. Clair, Missouri	2:31.5

INDOOR CABIN EVENT

1.—JOSEPH P. MATULIS	CHICAGO, ILLINOIS	12:07.6
2.—Donald Dodd	St. Louis, Missouri	11:17.0
3.—James Cahill	Indianapolis, Indiana	8:46.3
4.—Roy Wriston	Tulsa, Oklahoma	7:49.7
5.—Curtis Janke	Sheboygan, Wisconsin	7:43.2
6.—Robert Gibbs	St. Louis, Missouri	5:36.3
7.—Bob Christie	Tulsa, Oklahoma	5:19.0
8.—Milton Huguelot	Chicago, Illinois	2:32.3

HELICOPTER EVENT

1.—GEORGE LAMBROS	ST. LOUIS, MISSOURI	:59.7 (:47.3 sec. av.)
2.—Walter Gromm	Chicago, Illinois	:56
3.—Frank Vollrath	Indianapolis, Indiana	:42
4.—Vernal Ely	St. Louis, Missouri	:26
5.—Herman Plegge	St. Louis, Missouri	:20.1

SENIOR CLASS CABIN EVENT

1.—WALLACE SIMMERS	CHICAGO, ILLINOIS	14:01.6
2.—Robert Parsons	Floyd Knobs, Indiana	4:05.0
3.—James Craig	St. Clair, Missouri	3:09
4.—Milton Huguelet	Chicago, Illinois	3:08
5.—Robert Reed	Mattoon, Illinois	1:59

OPEN CLASS OUTDOOR CABIN EVENT

1.—GERALD DE WITT	DECATUR, ILLINOIS	8:33.7
2.—Jim Cahill	Indianapolis, Indiana	1:30.0
3.—Curtis Janke	Sheboygan, Wisconsin	1:12.2
4.—Joseph Matulis	Chicago, Illinois	1:03.2
5.—Roy Wriston	Tulsa, Oklahoma	:52.5

SENIOR CLASS GAS EVENT

1.—FRED ZAISER	ST. LOUIS, MISSOURI	4:07.8
2.—Henry Schneider	St. Louis, Missouri	2:55.5
3.—Breckenridge Issacs	Kansas City, Kansas	2:03.9
4.—P. Vacco	Chicago, Illinois	1:54.8
5.—Don Chase	Granite City, Illinois	1:47.2

STIX, BAER & FULLER GRAND AWARD

Best St. Louis Contestant.....Donald Dodd

COMET AIRPLANE COMPANY AWARD

Best Out-of-Town Flyer.....Joe Matulis, Chicago, Illinois

FRANK NEKIMKEN AWARD

Gamest Guy in Contest.....Bob Barron, Houston, Texas

AMATEUR SWEEPSTAKES

1.—ROBERT PARSONS	FLOYD KNOBS, INDIANA	5:42
2.—LeRoy Yeida	Herculaneum, Missouri	3:34.4
3.—Robert Dunham	Tulsa, Oklahoma	3:13
4.—Ray Dietiker	Woodriver, Illinois	1:49.7
5.—Elmer Konradi	St. Louis, Missouri	1:29

OPEN CLASS GAS EVENT

1.—GIL LANCASTER	ST. LOUIS, MISSOURI	4:52.6
2.—Roy Wriston	Tulsa, Oklahoma "B" Class	4:15.9
3.—Winford Davis	Kansas City, Missouri	3:36.9
4.—Dr. Ray Podolsky	St. Louis, Missouri	2:45.9
5.—George W. Meyer	Overland, Missouri	2:34

Engineered for Strength! Designed for Beauty! Tested for Flyability!

THE "MUSKETEER-STANDARD" 6 FOOT WINGSPAN —FOR 1/5 TO 1/4 H.P. MOTORS

Featherweight Construction—Weighs 2 lbs. 4 oz. Complete

Here is the new talk of the model world. A ship which is starting a new era in gas model competition. Whenever a "Musketeer Standard" starts climbing skyward, the rest of the show stops in amazement. Nearly every expert in the East has joined the swing to "Musketeer" design model. It will outclimb any and every model of equal power, regardless of weight or size. Glide? As only a high aspect wing with a soaring airfoil can perform. The best thermal catcher you ever saw.

LOOK WHAT THIS KIT CONTAINS!

Full size detailed plans . . . wooden parts printed out . . . semi-finished balsa blocks . . . plywood bulkheads cut to size . . . two colors of dope . . . large can cement . . . "Pervel" covering . . . ignition wiring.

At Your Dealer or Direct

$3.95 P.P.

Less Pneumatic Wheels and Power Plant

AGAIN! EASTERN STATES CHAMPION!!

FIRST —1937 Seversky Field, Long Island. Flown by Joe Raspante

FIRST —1938 Mercer Airport, Trenton, N. J. Flown by Harold Johnsen

FIRST —1939 Hadley Field, New Jersey. Flown by Harold Simmons

THE BUCCANEER-"STANDARD"

5½-Foot Wingspan—For 1/6 to ¼ H.P. Motors

No model can compare with the enviable record of the "BUCCANEER-STANDARD." When competition is keen she comes out on top. Whether in the hands of expert or beginner, she will turn in the top-notch performance you will be proud of. Kit is complete with printed wood, detailed plans, 3 colors of dope and the quality materials that are found only in BERKELEY kits.

$5.00 P.P.

The "SUPER-BUCCANEER"

7½ Foot Wingspan—For ⅛ to ½ H.P. Motors

The most famous ship in model building. Has won so many contests that it is impossible to keep an accurate account of its records. Kit is complete in every way. Printed out wood parts, full-size detailed plans, colored dopes.

$8.50 P.P. Less wheels and power plant

THE BERKELEY CATALOG

Get your copy today, either from your dealer or direct.

NOW ONLY **5c**

THE "CUSTOM CAVALIER"

9 Foot Wingspan—For ⅛ to ½ H.P. Motors

The "CUSTOM-CAVALIER" has been adopted by over 15 colleges and universities for experimental and radio control work. Its rugged construction, husky landing gear and smooth glide, make it possible to carry as high as 3½ pounds payload with ease. Kit is complete with printed wood, full size plans, colored dope and silk for covering.

Monocoque Construction

$15.00 P.P. in U.S.A. less wheels and power plant

BERKELEY MODEL SUPPLIES

"FIRST" IN GAS MODELS AND RADIO CONTROL

230 Steuben Street DEPT. U-54 BROOKLYN, N. Y.

News Flashes From Coast to Coast

Gary, Indiana—N.A.A. Contest Director Robert (Call me "Bob", will ya) Roberts has been organizing N.A.A. gas model chapters in La Porte, Valparaiso, Hammond, Whiting and Crown Point—all northern Indiana cities. These are all to be divisions of the up-and-comin' Northern Indiana Gas Model Association, but each city has its own local officers and governing set-up.

Jackson, Mich.—Pete Dillon, model builder par excellence and aggressive N.A.A. Contest Director, reports that in a recent competition low times and a small turnout were caused by a cyclone which "passed 20 miles south of here and the contest was run in the backwash of same. The wind velocity varied between 22 and 26 m.p.h. with intermittent showers."

But the contest went on just the same, says Pete.

Gas modelers bothered by a cyclone? NEVER!

Farmington, N.M.—Model plane enthusiasts are overjoyed by the efforts of D. Oscar Thomas who has started the competition ball rolling by a meet scheduled for September 22 and 23. Writes Mr. Thomas:

"I have obtained a proclamation from the Mayor of Farmington, designating Sept. 11 to 24 as Air Progress Observance days and since the San Juan County Fair is being held Sept. 22 and 23, the San Juan Flying Service has agreed to sponsor a model airplane show and meet for both rubber and gas entries."

It appears that at long last New Mexico is off to a good start and soon the "wandering" contestants from the East and Mid-West will be stopping off in the Southwest to attend New Mexico competitions.

Gas Lines

(Continued from page 23)

in favor of it or not.

Eastern States Contest

One of the most important contests held in the East was the annual affair held at Hadley Field, New Jersey, on August 12th—the Official Eastern States Gas Model Airplane Championships. This contest has become an institution, having been held every year for the past five years. The contest was not extremely large but every prominent and experienced model builder from the East who was able to attend was there; making a total of about 150 contestants.

A remarkable point about the contest was the smoothness with which the events were run off. There were two events; one for Class A models and the other for Class B and Class C models. Two flights per contestant, in each event, were allowed. An excellent system was established which consisted of dividing the contestants into groups. One group at a time was called for flying. When it was called the boys immediately had their models checked, were assigned timers and proceeded to the take-off runways. In this way confusion was prevented—those model builders in the groups that were not flying at any particular time had a chance to tune up their planes and make them ready. Because of this procedure the number of crack-ups were very

NEW THIS MONTH

Powerhouse

A BUNCH IGNITION COIL

SMALLEST and HOTTEST COIL EVER MADE

Another milestone is reached in model progress as Bunch Engineers lead the field with the new "POWERHOUSE" coil. Slashes over 1/3 the weight compared with lightest model coils available. Graphs show highest spark output ever reached plus greater resistance to excessive voltage. Operates on smallest model batteries. Measure and compare the size below. Get this POWERHOUSE coil, gain performance through reduced weight and hotter spark.

POWERHOUSE COIL . Postpaid $1.50

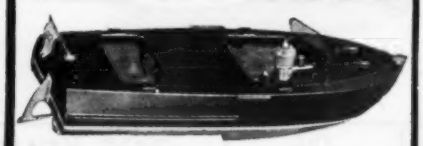
THIS SIZE COIL IN GENERAL USE THRU 1938. Height 3" Diameter 1 1/8" Weight 4 oz. ~~Cost $3.00~~

THIS SIZE COIL IN GENERAL USE TODAY 1939. Height 2" Diameter 1 1/8" Weight 2 3/4 oz. ~~Cost $2.50~~

NEW POWERHOUSE COIL Height 1 3/8" Diameter 1-1/16" Weight 1 3/4 oz. Price $1.50

A 24" Speedboat You Can Build —

SEA HORNET



Enjoy gas powered speedboat racing this summer. Built like a regular boat; no trick assembly methods. Cut out and notched frames, keel, motor beams, balsa planking and fabric covering. Complete with drive shaft, propeller, rear strut, stuffing box and all fittings.

SEA HORNET $11.50

SPEED DEMON

GAS MOTOR RACE CAR

Setting up this 20" Speed Demon automobile is an easy task. All parts and assemblies furnished manufactured with complete illustrated instructions to bolt together and install engine.

Clutch drive mechanism exclusive with the Speed Demon permits racing on any reasonably smooth surface and prevents stalling on the getaway. No special race track needed.

The Speed Demon has gained fame as the car anyone can run day in and day out at little expense. The only racer capable of car to car competition in this King of gas model sports. Get yours today!

Kit includes everything except engine and flywheel $16.50

CATALOGUE AND PARTS LIST. RACE CARS, SPEEDBOATS, MOTORS Send for complete details 10c

ORDER BLANK

"Powerhouse" Coil	$ 1.50 ☐
Speed Demon Race Car	16.50 ☐
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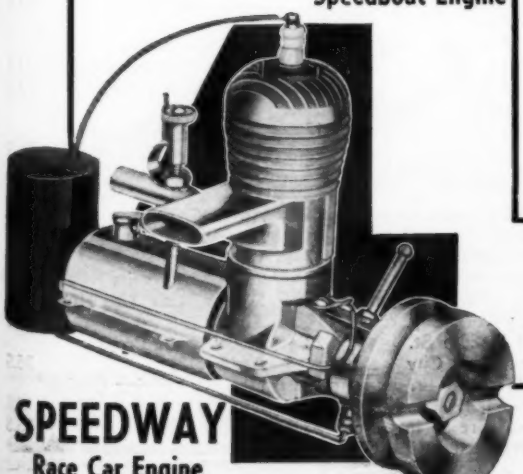

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HORSEPOWER — All Bunch engines 1/3 h. p. at 5200 R. P. M. ¼ h. p. at 8500. Displacement 45 hundredths cubic inch. Bore ⅞; Stroke ¾. Overall height 4¼ inches.

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Gwin Aero Inverted Kit	9.85 ☐
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Mighty Marine Engine Kit	10.85 ☐
Speedway Race Car Engine	14.00 ☐
Speedway Engine Kit	11.85 ☐

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54¢

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If gas models were sold by the foot, that's all you'd pay for this 5½ foot THUNDER BIRD on this special offer. Complete kit, all woods, printed sheets, cements, dopes, less wheels, for only..... **$2.95 pp**

The THUNDER BIRD has been completely redesigned from nose to rudder. Cleaner lines, stronger construction, faster climb, and longer glide are only a few of the features. Kit to build the 45" THUNDER BIRD, for small motors (Class B) a dead-ringer for the six foot super performer, less wheels, for only.... **$1.50 pp**

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High performing, contest winning, Brown Jr. D, for $12.50 pp or $9.95 with your old motor.

Six foot LANCER kit, featuring streamline performance and design, a radical departure in looks and flying ability..... **$3.95 pp** less wheels or $5.95 PP with air wheels, colored dope and finished prop. The 48" LANCER, for Class B motors, $1.95 PP less wheels, or $3.50 with air wheels, colored dopes, and finished prop.

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The HOL-TITE battery box, developed after hours of field testing and proven by hundreds of tests. Aluminum construction, light, easy to mount, positive in contact. A positive aid to good flying. For medium or large size cells, specify which. Single cell type, 35c, two cell type for 50c.

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MODEL AIRPLANE LINE

Manufacturer pushing other lines is willing to dispose of entire rubber-powered and solid model airplane line. Complete line of 37 models with plans, wheels, boxes, plates, cuts, and all materials needed, together with sources of supply, etc. Over 1,000,000 sold to date at prices of 10c to $1.00. For interview write Box G, Model Airplane News, 551 Fifth Avenue, N.Y.C.

NEW 1939 AUSTIN AIRDRAULIC FLIGHT TIMER

U. S. Pat. Pend.

NOTE THESE NEW IMPROVEMENTS

- **Easier adjustment.** New design makes possible quicker, more accurate setting for 20 or 30 second motor runs.
- **Stronger contact spring.** Gives positive contact even under severe motor vibration.
- **Stop watch accuracy.**

The only timer with these exclusive features:

- Adjustable duration from 1 second to 10 minutes.
- Weighs only ⅝ of an ounce. The lightest Timer made.
- Only one moving part. Will outlast any mechanical timer.
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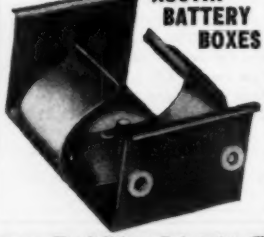
- Most dependable timer made. No complicated parts to jam.

• The only Timer to carry an unconditional GUARANTEE against defective parts or workmanship.
• Special instruction sheet with installation and wiring diagram given free with each timer.
• And best of all, the price post paid is **only $1.25**

AUSTIN BATTERY BOXES



These new battery holders are the most practical way of mounting the batteries in your ship. The cells are held securely in place, yet may be quickly replaced without soldering any connections. The holders may be shifted for balance adjustment from outside the ship by means of an attachment screw. They hold two cells in series. They now come in all three sizes and weigh only ¼, ⅜ and ½ oz. Penlite and 1" dia. sizes, 40c. Large 1¼" dia. size, 50c.

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The leading manufacturer of gas model accessories

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much fewer than in the average contest.

As usual, there were many interesting types of planes present and one of the outstanding flights was made by Louis Garami of Jackson Heights, New York, with his Class A model powered by the Atom motor. This little ship made its way upward like a skyrocket and finally disappeared from the view of the timer after a period of 195.9 seconds. This flight established a new world's record for Class A models.

In the Class B and C Event R. Simmons of Middlesex, N. J., was the winner with a time of 209.7 seconds.

Though the day was sunshiny and clear, there were few thermals and a comparatively strong breeze. Scattered cirrus clouds overhead throughout the day gave evidence of the lack of thermals. Considering this and the breeze, flight times were excellent. A number of models remained in the air much longer than the official time of the flights given. This was verified by a number of model builders who pursued their models for several miles before they came down far from the starting point.

The contest was sponsored by the Metropolitan Model League and MODEL AIRPLANE NEWS. It was directed by Mr. Nathan L. Polk and Charles H. Grant. Mr. Irwin S. Polk, who was to assist as another director, was suddenly taken ill, which prevented him from being present. This was doubly unfortunate because he had done all the preparatory work for this meet; laying out the system of procedure, sending of applications and other important points. It was unfortunate he had to miss this event upon which he had worked long and diligently. He did all the preliminary ground work and was largely responsible for the smooth and effective running of the meet. All contestants keenly missed his presence, but we are now happy to report he is completely well again.

Special mention should be given to Mr. Sam Block, who, as usual, worked long and diligently assorting and keeping the records of the flights. It was through his excellent work that the prizes were distributed immediately following the contest without the delay which is often entailed. Those who have had experience in running contests will probably recall with very little joy the tedious procedure necessary to determine the winners after all the record flight times have been assembled.

At this contest, as at the Nationals, a box which was divided into a series of pigeonholes was used to hold the flight record cards. Each particular pigeon-hole represented a particular span of flight time. For instance, one hole was zero to one minute; the second hole was from one minute to two minutes. In this manner the longest flight might be determined at any time during or at the end of the contest. Possibly other contest directors may wish to use this system at meets which they run.

Following is a list of the winners and their times.

CLASS A

NAME		ADDRESS	AGE	PRIZE	TIME
L. Garami		3705 64th St. Woodside, N.Y.	41	Irwin S. Polk Trophy Forster Bros. motor	195.9
G. Moro	145	78 Plauderville Garfield, N.J.	25	Paul K. Guillow Trophy Bunch Race Car Engine	48.6
L. Shulman	96	1514 W. 7th St. Brooklyn, N.Y.	19	1 Herkimer Std.	45.8
P. Plecan	26	36-11 Steinway St. Queens, L. I.	20	The Aero Spark 1-1 1/2 Volt Aero Coil	44.5
W. Marlatt	129	Parkview Apts. Harrisburg, Pa.	19	Duro Metal Grinder	32.2
J. Lieberman	64	290 Chadwick Ave. Newark, N.J.	17	Syncro Devices Power Saw	28.5
H. Friedlander	127	2527 Cartelyon Rd. Brooklyn, N.Y.	17	Aircraft Gas Model Kit	23.8
W. Lang	45	533 Palisades Ave. Jersey City, N.J.	24	Austin Craft Austin Mose	23.0
R. Oliver	25	129 Linden Avenue Paterson, N.J.	17	W. J. Voit 6 pr. 2 1/2" voits	22.75
A. Block	114	2337 Grand Concourse New York City	17	Megow "Cub" Gas Model Kit	22.5
J. Ogilvie	61	319 E. 88th St. New York City	22	Model Craft Props Ass'd (12)	16.5
S. Taibi	22	1558 W. 5th St. Brooklyn, N.Y.	19	Megow's "Flying Quaker" Kit	14.5
W. Kessler	58	31-29 Greenpoint Ave. Long Island City, N.Y.	23	"Zipper" Kit	13.5

Amazing Performance..Amazing Values

All the thrills and excitement of gas model flight with these six Gas Type Rubber Powered planes. It's fun to build them from the famous Guillow construction kits. It's more fun to fly them . . . and you'll find them real aces, either for contest flying or for just plain sport. No matter how much you pay, you can't buy more real value and trouble-free satisfaction.

Every model is scientifically designed. Only dependable selected materials are used. Remember that these kits come from one of America's oldest model-plane factories.

Ask your dealer about these Guillow models, and step out ahead of the crowd with a hangar full of these keen new flyers.

GAS TYPE FLYING MODELS (Rubber Powered)

››› GT1 CUB—36" Wingspread

Looks, flies, and sounds like a real gas job. The GT1 will fly with the best of them. Watch it climb, level off, and streak across the sky in smooth flight. It's a smart ship from prop to tail assembly.

50c for Complete Kit (no liquids) at your dealer's

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GT4 GULL WING SPORTSTER

A sporty flyer with sleek lines and sweep-back wing of 36" spread. Designed for simplicity and performance, with many features found only in higher priced kits. You'll get more seconds of flight duration with this smooth job.

Complete Kit (no liquids) Retail **50c**

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GT2 MERCURY

A big plane with 36" wingspread. Flies like a million, but is easy to build with this low-cost kit. Hear that "motor" purr as this clean-lined job does its stuff.

Complete Kit (no liquids) Retail **50c** Mailing charge 15c.

GT6 SKY CHIEF (36")

Built in answer to demands for a large wing span model of simple, rugged construction. SKY CHIEF achieves this aim without the least sacrifice of performance. Real value is built right into this kit. We're proud to add it to our line of champions.

Complete Kit (no liquids) Retail **50c** Mailing charge 15c

GT5 (36") SINGLE MOTOR TRANSPORT

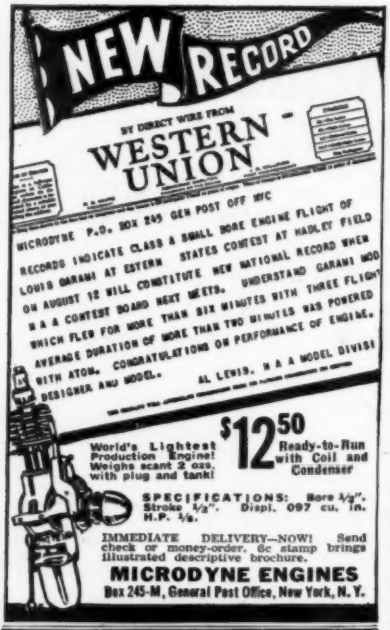
See this model overhead and you'd think it was one of the big transports you read about in the papers. Note the twin rudders that feature this plane and help keep it stable on long climbs and smooth flat glides. We guarantee you'll be completely satisfied with this splendid kit. Complete Kit (no liquids) Retail **50c** Mailing charge 15c

GT3 GIANT 50" ENDURANCE MODEL

Imagine building a flying model of over 4 ft. wing spread for so little cash. Stop, look, and listen to this sky giant in flight for the thrill of a lifetime. It's scientifically designed and of selected materials.

Complete Kit (no liquids) Retail **50c** Mailing charge 20c

PAUL K. GUILLOW • • • • WAKEFIELD, MASS.


NEW RECORD
BY DIRECT WIRE FROM
WESTERN UNION
MICRODYNE P.O. BOX 245 GEN POST OFF NYC
RECORDS INDICATE CLASS B SMALL BORE ENGINE FLIGHT OF
LOUIS GARAMI AT ESTERN STATES CONTEST AT HADLEY FIELD
ON AUGUST 12 WILL CONSTITUTE NEW NATIONAL RECORD WHEN
N A A CONTEST BOARD NEXT MEETS. UNDERSTAND GARAMI MOD
WHICH FLEW FOR MORE THAN SIX MINUTES WAS POWERED
AVERAGE DURATION OF MORE THAN TWO MINUTES WAS FOR ENGINE.
WITH ATOM. CONGRATULATIONS ON PERFORMANCE OF ENGINE.
DESIGNER AND MODEL. AL LEWIS. N A A MODEL DIVISI
World's Lightest Production Engine! Weighs scant 2 ozs. with plug and tank!
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SPECIFICATIONS: Bore ½". Stroke ½". Displ. .097 cu. in. H.P. ⅛.
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Wings & Prop EMBLEM 4 Colors, Silk Chenille, 7½" 45c

CLASS B-C

NAME	ADDRESS	AGE	PRIZE	TIME
R. Simmons	Mountain Ave. Middlesex, N.J.	19	Model Airplane News Trophy Hi-Speed Sales "Torpedo"	209.7
R. Campbell	16 Lafayette Stamford, Conn.	16	Junior Motor Trophy Syncro Ace gas engine	157.7
W. Eggert Jr.	1919 Stanwood St. Philadelphia, Pa.	18	Flying Aces Trophy Syncro Devices jig saw	139.1
A. Scheid	65-10th St. Woodridge, N.J.	31	The Aero Spark Co. 1-3 Volt Aero Coil	138.1
E. Tanis	432 E. 24th St. Paterson, N.J.	17	Scientific "Mercury" Kit	136.2
H. Friedlander	2527 Cartelyon Rd. Brooklyn, N.Y.	17	Berry Bros. Berry Products	133
L. Shulman	1514 W. 7th St. Brooklyn, N.Y.	19	JBS Thermometer Prop	106.5
J. McPheat	40-33 76th Et. Jackson Heights, N.Y.	25	Megow "Commander" Gas Model Kit	103.6
R. Oliver	129 Linden Ave. E. Paterson, N. J.	17	JBS Thermometer Prop	102.4
C. Simmons	Mt. Ave. Middlesex, N.J.	21	Scientific "Eaglet" Kit	98.6
F. Lashek	30 Broad St. Manisquam, N.J.	22	Austin Craft Austin Mose.	96.7
W. T. Flinn	581 Lenox Rd. Brooklyn, N.Y.	35	Large Box general supplies	85.5
E. Lynch	18 Everett Pl. Plainfield, N.J.	30	Scientific "Eaglet" Kit	82.7

Pictures No. 1 through No. 12 give you a few of the highlights of this Eastern States Meet.

Picture No. 1 shows Walter Saline's tailless model getting off to an excellent start. This ship flew quite well though some of the flights were marred by maladjustment of the surfaces.

Picture No. 2 shows the largest model at the contest. It is of excellent design and had a span of twelve feet and was built by Ed and Carmen Luca. It was powered with a Brown Junior motor and made some very stable flights.

Picture No. 3 gives you an excellent example of what NOT to do if you wish your flight to be efficient, provided the contest director knows his business. As you can see, the plane is being literally LIFTED into the air by the contestant grabbing the wing with both hands. THIS IS NOT an unassisted take-off. Some model builders have done this to their sorrow, for their model has gotten off and left a goodly portion of the wing in the hands of its starters. This occurs especially when wing spars are light.

Picture No. 4 shows one of the most beautiful ships at the contest. It is a gull wing, one wheel, twin rudder job built by Armand Vanguez. It gives evidence of beautiful workmanship; even the engine was cowled in a very finished manner. It made a number of very fine flights but unfortunately crashed due to some maladjustment of the wings.

Picture No. 5 shows our old friend Mr. Block busily engaged "pushing his pencil" at the registration table.

Picture No. 6 shows you a tense moment in the life of a very ardent model fan. Three guesses as to his name. Both of his ships shown here flew beautifully and showed unusual stability.

Picture No. 7 shows Gilbert Shurman with his one-wheel job, which gives evidence of fine streamlining.

One of the most interesting models at the contest is shown, with its builder, Donald Beinler, in picture No. 8. It is a scale SE-5, the construction of which is carried out in great detail, as you can see. Unfortunately it lacked stability and crashed.

Picture No. 9 shows a properly executed take-off. You will note that the model is getting under way without assistance from the starter.

One of the most beautiful and finest fliers at the contest is shown in picture No. 10. It is a three-wheel cabin job, built by Joe Fritsch, which provided a real thrill to watchers as it soared all over the field. The usual nosing over tendency on landing was not present due to the single front wheel.

Believe it or not, one of the finest flying models at the contest was the tailless

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18" Balsa Strips Selected Hard Stock
1/16 sq. 60 for 5c
1/16x⅛ 35 for 5c
1/16x3/16 18, 5c
1/16x¼ 15 for 5c
3/32 sq. 30, 5c
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2" & 36" cost twice
18"; 3x36, 3 times.

NOSE BLOCKS
1x2x1 1c
2x2x1 2c
2x2½x1 3c
3x3x1 4c
3x3x2 7c
3x3x3 9c
5x5x2 17c

5 FOOT BALSA
½x3/16 12 20c
½x¼ 10 20c
3/16 sq. 8 20c
¼ sq. 6 20c
¼x⅛ 3 20c
⅜ sq. 2 20c
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Sheets, 4 times 18".
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18" Balsa Planks
⅛x½ 2 for 5c
1x1 1 for 5c
1x2 1 for 9c
2x2 1 for 16c
2x3 1 for 22c
2x6 1 for 38c
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Plastic Balsa
4 ozs. can 25c.
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⅝x1x3 3—5c
⅝x1¼x10 3—5c
⅝x1¼x12 3c ea.
1x1½x12 5c ea.
1x1½x15 6c ea.

MODEL PINS
Pkg. 100 ½" 5c

GAS MOTORS—p.p. Ready to Run
Free prop & Oil
Ohlsson 23..$16.50
"Gld. Seal 18.50
Brown Jr D 12.50
Brown Jr B 21.50
Syncro Ace 9.95
Forster 17.75
Dennymite 15.85
Mighty Mdg. 9.50
In Kit Form 7.85
Gwin Aero ..12.00
Big allowance for old motors.

CHAMPION PLUGS
⅜ or ½ 65c ea.

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1½ volt $3.00 p.p.
3 volt $2.75 p.p.

Austin Flight Timer (PP) $1.25
Gas Funnel.....25c
SAE-70oil2oz.15c
Xhaust Manifld
Nickel-plated—pp
Brown, Bunch 85c
Condensers 20c

MODEL KNIFE
Steel blade.....10c

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½-8 5c—¾-6 5c
1"-4 5c

TISSUE. AA
All col., doz. 10c
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Supertine, white 5c

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20x30....2 for 17c

BAMBOO PAP'R
White .....5c ea.
Colors ....2 for 15c
Gas Model Silk
Heavy Qual.yd. 40c

WIRE
.014 6 ft. 2c
.020 .028 6 ft. 3c
.034 .040 6 ft. 5c
.049 6 ft. 8c
1/16" 3 ft. 5c
3/32" 5 ft. 15c
⅛" 5 ft. 25c

BROWN RUB.
1/16 sq. 15 ft. 5c
⅛ flat 15 ft. 5c
3/16 flat 12 ft. 5c
8 x 1 in. 225 ft. 1/16 35c. ⅛ 60c, 3/16—85c

Dummy Rad. Engine (Colic.)
1½" 8c. 2" 12c
2½" 14c. 3" 17c

Sheet Celluloid
5x7-4c 14x17-15c

CEMENT
CLEAR DOPE THINNER
1 oz. 5c. ½ pt. 20c
2 ozs. 9c. pint 35c

Colored Dope
1 oz. 6c. 2 oz. 11c
½ pt. 35c, pt. 60c

PROPELLERS
Balsa Paulo Ritz Wina Gas
5- 4c- 7 Mod.
6- 5c- 9
7- 6c-12- 9-40c
8- 7c-15-10-40c
9- 8c-19-11-40c
10- 9c-23-12-50c
12-10c-28-13-50c
14-12c-X -14-50c
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Alum. Tubing
1/16.....6c ft.
3/32. ⅛.....7c ft.
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Sheet Alum. sq. ft.
.003-10c .010-15c

SPRAY GUNS
Sm. 59c; Lge. 97c

Prop Shafts—doz.
Sm. 6c Lge. 10c

WHEELS per pr.

Brch	Balsa	Aluminum
¼	.01	.03
⅜	.02	.04 .05
1	.03	.05 .07 .06
1⅜	.04	.07 .10 .09
1⅝	.06	.10 .16 .12
2½	.12	
3	.15	.30

Trexler Wheels
1¼, 1½—40c1 pr.
1¾, 2—50c 1 pr.
2¼, 2½,—60c 1pr.
Gas Mod. 2¾—$1
3-1.25—3½-1.50
4½-1.75 all p.p.

M&M WHEELS
1¼, 1½, 1¾-50c
1⅝, 2, 2½-60c
Gas. Mod. 2¾-90c
3¼ 1.50, 3½ 2.75
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MICROFILM RUBBER LUBE WOOD FILLER
1 oz. 9c, 2 oz. 15c

Alligator Clips 5c
Mask. Tape cd. 5c
Toggle switch 30c
Spag.Tub'g 3' 10c

FREE with all purchases over $1.00 your choice of: (1) Model Water Sprayer. (2) Model Builder's Knife. (3) Choice of 2-20" Model Plans—Curtiss, Heathe, Boeing, Driggs, Bellanca. (4) Masking Tape. (5) 6 sheets AA Tissue.

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REAL ENGINE VALUE—$5

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AN ENGINEERING TRIUMPH . . .

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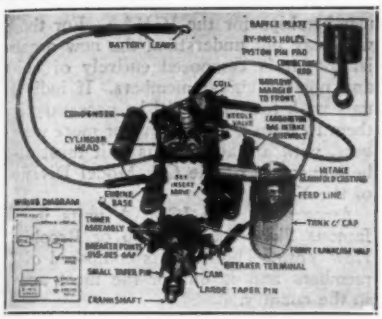
Indeed an engineering triumph—accomplished by outstanding G.H.Q. designers and engineers, who have constructed into the G.H.Q. motor everything that years of exhaustive scientific aerodynamic research could produce—geared to the highest possible degree of perfection. But more than that, the acid test . . . an overwhelming response. Thousands of users in all parts of the country are praising, recommending, and endorsing this scientific achievement. It seems as if everyone in America wants one. The most hair-raising thrill you've ever experienced will be yours with the G.H.Q. motor—actually one of the most powerful motors ever constructed. Has broken records for amazing performance . . . and just imagine—flies model planes up to 10 foot wingspread. AND JUST AS EFFICIENT FOR BOATS, MIDGET CARS AND STATIONARY USE. Easy to start and simple as ABC to assemble.

Everything is in the kit including Champion spark plug, Winston coil, condenser, tank and cap, ignition wire, cylinder, piston, connecting rod, timer, crankshaft, all screws, nuts, bolts, complete instructions, etc. Every part is fully machined and finished. No oil, gas, batteries, or propeller included. A SCREWDRIVER IS THE ONLY TOOL YOU NEED.

EXACTLY THE SAME PARTS THAT GO INTO THE G.H.Q. ASSEMBLED ENGINE

ALL PARTS GUARANTEED

Average Assembly Time 30 Minutes



THE ONLY ENGINE WITH A WARRANTY—APPLIES TO BOTH ASSEMBLED ENGINES AND KITS

Over 7000 of these same famous G.H.Q. Gasoline Engines have been sold at $8.50. Mass production methods and enthusiastic reception have enabled us to reduce the price from $35 originally TO THE NEW LOW PRICE OF $5.00.

The new 1939 model now for sale includes the new unbreakable steel stamped piston giving high and perfect compression, drop forged one-piece crankshaft, self oiling "Ledaloyl" bronze bearing, etc.

SPECIFICATIONS

4 Port 2 Stroke Cycle. ¾" Stroke. 15/16" Bore. 300-7,000 R.P.M. Turns 14" Prop. 8" Pitch. Bearing Surface, 1¼" Long. Crankshaft, 5/16" Diam. Weight, 10 oz. (Motor) Rotation, Either Direction. Height, 4½"—Width, 2½". H.P. Approx. 1/5th.

G. H. Q.'s FIFTH YEAR!

Thousands of Satisfied Users! Read some of these testimonials on file with us:

J. B., Providence, R.I.—"A few weeks ago I received the G.H.Q. motor kit and it is running perfectly. I hope to write you soon and tell you about some excellent flights."

R. H., Prairie du Chien, Wis.—"Your motors sure can take a lot of abuse and knocking around and yet perform perfectly. I have had two in a period of about two years and have seen higher priced motors give less service and performance."

W. W. M., Russellville, Ark.—"I received my G.H.Q. Motor Kit and am very well pleased. I had motor together in 1 hr. 40 min. I will place order next week for G.H.Q. Sportster Kit."

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A. K., Hillside, N.J.—"I still can't understand how you can put such a dependable and rugged engine on the market at such a low price."

E. T., Sayville, N.Y.—"Received my G.H.Q. Kit okay and am more than delighted with same. You've got 'em all beat for price and performance."

R. P., Hamburg, N.Y.—"I want to extend my personal thanks to G.H.Q. for their prompt service. The motor I ordered was received within 24 hours. Such service cannot be surpassed. I also want to say that I have the motor running perfectly. I shall do all I can to help promote the success of G.H.Q."

H. H., Midlothian, Ill.—"Motor assembled correctly and performs perfectly. I am fully satisfied."

L. N., So. Euclid, Ohio—"Received my finished motor. I am very pleased with it and runs fine. I will be glad to encourage others to get G.H.Q. motors."

C. C., Chicago, Ill.—"I received my motor and I am quite satisfied and surprised at the precision parts for the money."

E. E. F., Mare Island Navy Yd., Calif.—"I saw your offer of a complete G.H.Q. Gas Engine Kit for only $5 in the August issue of Mechanix Illustrated. I have just cracked up the G.H.Q. that I bought this spring. It had over 50 hours on it, and I have had very little trouble with it, and made my own repairs whenever the engine needed them. As I was glancing thru the magazine, the ad struck my eye. At that price I will be able to pursue my favorite hobby again, gas power models."

THE G. H. Q. GAS ENGINE CAN BE USED IN BOATS MIDGET CARS & PLANES WITHOUT ANY CHANGES

The G.H.Q. Gas Engine sold four years ago for $35. Today, you can secure a vastly improved engine kit for only $5. How is this possible? Simply because we have invested thousands of dollars in tools, jigs, dies and equipment to produce the only mass-production motor in the market. All parts are uniformly perfect.

1939 SALES OF G. H. Q. ENGINES ARE AT THE RATE OF 12,500 A YEAR

DEALERS!

The G.H.Q. MOTOR KIT and the new low-priced

ROBOTAIRE

are sweeping the country. Get your share of this business!!

Our new discount schedule gives larger dealer discounts than ever before!

Write in Today!

WHY HANDLE G.H.Q.?

1. **Little investment needed.**
2. **Attractive discounts.**
3. **Nation-wide advertising.**
4. **Free circulars for imprint.**
5. **Free display cards.**
6. **Full manufacturers co-operation.**

From Among Our Many Dealers' Enthusiastic Letters:

SCRANTON HOBBY CENTER, 525½ Linden Street, Scranton, Pa.:
"I would like to say that I am very much satisfied with the results my customers have had in assembly and running of your motor kits. I have sold to date all but one of the engines which we have purchased from you, and they are all running successfully."

MODEL BUILDERS GUILD, 81 Lawrence Street, Hartford, Conn.:
"Your engine here in the city is popular with the boys and we expect to sell them very fast this summer; that's why we have started to buy them by the dozen."

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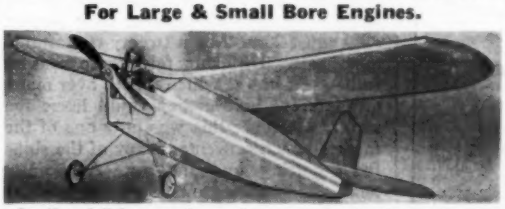
★ Visit us at our new, enlarged factory and showroom at 40 East 21st Street. Complete line of hobby-craft on display. ★

★★★★★★★★★★★★★★★★★★★★★★

THE ROBOTAIRE

A new trim, streamline gas modelplane. ***5 foot wingspan.***

For Large & Small Bore Engines.



Small and light enough to take any engine in the market, and rugged enough to take engines up to 1/3 horse-power, the **ROBOTAIRE** was especially designed for the G.H.Q. Engine on which it has been flight-tested for over 100 hours in the experimental model. Construction has been planned so that even a beginner can build the **ROBOTAIRE** easily and quickly. Plans and instructions are detailed and simple.

Kit is absolutely complete including plans, bamboo paper, wood, wheels, metal motor mount, cement, dope, etc.

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★ 1/5 H.P. Bore ⅞". Stroke 13/16". Displacement .488 cu. in. Standard equipment includes 2-piece spark plug with pointed electrodes; special timer for perfect ignition at top-speeds; new style carburetor; ignition coil with special mounting clip; and condenser.

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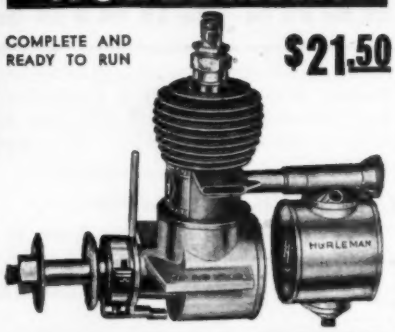

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The Mighty ATOM is an achievement in precision engineering! Molybdenum Chrome-Steel Cylinder & Piston (Heat treated, machined & lapped to ONE TEN THOUSANDTH OF AN INCH ACCURACY!). Snap-On and Off, Transparent Tank, Positive scavenging at all speeds! Flood-Proof! Only $12.50 with Coil and Condenser. Get a Mighty ATOM—NOW! At dealers, or direct!

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This Handy Set of Modeler's Knife For Modelmaking Of Airplanes and Small Boats; Crafts & Art. Is the BOYS Best Friend.
The Blades Are Made Of Imported Swedish Spring Steel Tempered and Polished.
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By NILS SEAHOLM
139 Kingsbridge Road Mount Vernon, N.Y.

model shown in picture No. 11. This plane did everything that the orthodox plane could do and was exceedingly stable. This stability was derived merely by two reflexed ailerons at the wing tips. The angle of incidence of the wing was constant throughout its span up to the ailerons.

One of the most successful and finest flying biplanes that ever appeared at any field is shown in picture No. 12. From its appearance one would not imagine that its performance would be unusual. It is true that the flights were not high or unusually long; however, this little plane was flown continuously, one flight after another, from early morning until late in the afternoon. Without doubt, it has a record for consistency. The picture also shows its creator, Steve Curtiss.

First Eastern Gas Seaplane Contest

Another of the most interesting events to take place up to the present time was the first Eastern States Seaplane Contest sponsored by the Metropolitan Model League at Lake Hopatcong, New Jersey, on August 20th. About twenty contestants took part. Unfortunately there was a rather stiff breeze which turned over many of the ships before they could leave the water. However this was only one of the factors which prevented many of the ships from getting into the air. Apparently most of the contestants were not familiar with the design of seaplane floats and the manner in which they should be attached to their planes.

Only about 20% of the planes were able to get off the water, and Sol Taibi, the winner, was the only contestant who made three official flights. Unquestionably greater success will be had after the model airplane builders will have a chance to do a little experimenting. Nevertheless a few hints at this point will not be out of place. One of the most important points is:

Do not have the step of your floats back of the CG of your model. As a rule it should be slightly forward of the CG.

The angle of the surface of the float immediately in front of the step should be approximately parallel to the chord of the wing. When the floats are attached in this manner the plane is able to lift itself from the water soon after the floats support the plane on the water's surface. If the angle of the float is greater than the angle of the wing chord to the line of flight, the angle of attack of the wing when it is taking off will be very small and consequently the lift generated will not be sufficient to lift it from the water.

All floats should extend well forward of the propeller. This keeps the model from nosing over upon landing. Also it prevents it from tripping on small waves which might be present.

Picture No. 13 shows Sol Taibi's ship in full flight after it has lifted off the water.

Picture No. 14 shows a group of model builders with their planes lined up on the shore.

Picture No. 15 shows the winners of the contest: Right to left, Taibi, first place; Murray, second place; McMurray, third place.

IGMAA

We have received a number of new club memberships for the IGMAA. For those who may not understand the new organization, it is composed entirely of units and not individual members. If individuals wish to join it will be necessary for them to form a unit of five or more members, with a leader. This unit must also be a member of the Gas Model Division of the NAA.

Among the new IGMAA units is the famous Sky-Scrapers Club of Brooklyn, New York. This Club is composed of 25 members and is one of the most active in the country.

Another new unit is in Spokane, Washington. It is the Maurie's Model Shop Model Club of 814 Sprague Avenue, of which Maurice J. Schanks is the leader.

A request for membership and charter has also been received from old IGMAA Unit No. 88—the Waco Gas Model Airplane Association—of 2704 Ethel Avenue, Waco, Texas. Charles Woodward is secretary-treasurer.

Old units which wish to rejoin should write in immediately for their old numbers, otherwise new numbers will be assigned to them after November 1st. Upon request new membership cards will be issued to club leaders so that they may be distributed properly to the club members. A charter form will also be issued to the units which join.

Unit One: Pittsburgh, Pa.

With the added interest shown since one of the members of Unit One, IGMAA, placed high in the National Model Airplane Competition at Detroit, it was decided by the Board of Governors to open the charter for membership once more. An open meeting was held on July 31st at the Pittsburgh Boys Club, 4412 Butler Street, Pittsburgh, Pa.

An interesting program was planned, along with the plans of the organization and its aims to be further expounded upon. Any or all gas powered model enthusiasts were invited to attend this meeting and many of those persons who are really interested in model flying for sportsmanship joined the groups.

A full schedule of contests holds the attention of all IGMAA members and they intend to visit these several meets in uniform.

It is hoped locally that they will exhibit the fact that Pittsburgh is really gas model conscious.

Third Allegheny Mountain Area Meet

The Third Allegheny Mountain Area Model Meet attracted several national model figures, such as Henry Thomas, National Exchange Club Trophy winner, Dick Everett, Ed Fulmer, and others of well-known and deserved fame. The meet, which was held at the IGMAA Model Airfield, on July 23rd, started off at noon with a zip that was carried throughout the day, and the final flight of Fred Faller set the time for the Senior Gas winner, which enabled him to take first place.

To the surprise of the new spectators in this area, a large number of the fairer sex were on the field, acting as "grease monkeys" for their respective boy friends or hubbies. Many of them proved their ability and adaptability to work with the necessary tools.

In the Gas Event the Pittsburgh unit of the IGMAA took three places in a total of seven, which was more than any respective group took in any single event. Also, a member of the Unit One took first with his Denny-Powered Zipper climbing into the air and soaring out of sight after five minutes and thirteen seconds, for the high time of the meet. Total times and places in seconds, with average of three flights recorded, are shown below, following the procedure of the NAA.

Gas Powered Event:

OPEN		
John Eberlee Pittsburgh, Pa.	Unit One IGMAA	147.06 sec.
Richard Everett Elm Grove, W.Va.	Flying Barn Doors	106.3 sec.
Wm. Benett Finleyville, Pa.	Model Wings	94.3 sec.
SENIOR		
Fred Faller Pittsburgh, Pa.	Unit One IGMAA	96.33 sec.

Fuselage Event:

OPEN		
Henry Wise Akron, Ohio	Edith Van Orman Chapter Akron, Ohio	250 sec.
Henry Thomas Akron, Ohio	Edith Van Orman Chapter Akron, Ohio	113.3 sec.

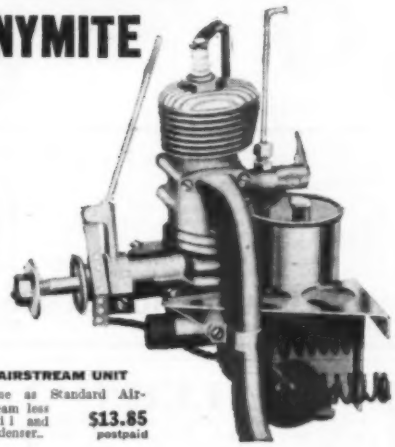
Stick, H. L., Event:

OPEN		
Dick Everett Elm Grove, W.Va.	Flying Barn Doors	117.3 sec.
SENIOR		
Chas. Harriss Johnstown, Pa.		112.5 sec.

While these times do not show a lot of competition, still it is readily comprehensible that several places were not ascertained until the last half hour of flying. It may further be stated that larger contests in the future are expected throughout the Pittsburgh area, and a large attendance is expected in all those Allegheny Mountain Area Meets. A widespread interest in model aviation activities is in the ascendancy, through the number of

★ AIRSTREAM DENNYMITE

Airplane enthusiasts: There is more power packed into the Airstream Dennymite than you will ever use. Consider the grueling runs given model racing cars—at 60 miles per hour the Dennymite turns over 10500 r.p.m., for distances of 4 miles.



SPECIFICATIONS
Displacement .57 cubic inch—bore 9/10—stroke 9/10—¼ horsepower at 6500 r.p.m.

DELUXE AIRSTREAM
Complete with coil, condenser, Dural motor mounts, De Luxe long exhaust and exclusive spring choke..... $17.85 postpaid

STD. AIRSTREAM
Complete with coil, condenser and short exhaust stack $15.85 postpaid

AIRSTREAM UNIT
Same as Standard Airstream less coil and condenser.. $13.85 postpaid

★ *New "DELUXE"* MERCURY MIDGET

Can be assembled, ready to run in 2 HOURS!

The Original MERCURY MIDGET

In Presenting . . .

the new DeLuxe Mercury Midget the Reginald Denny Industries feel that the Dooling Bros. have made an outstanding contribution in the field of model racing. The marvelous records and victories won in the past gives positive assurance that this new car will be the fastest and most popular racing car in America!

FLASH! The Mercury Midget wins 1st, 2nd, 4th, 6th, 7th and 8th places in the inaugural race on the new banked Miniature Speedway at Culver City, Calif. on Labor Day. The fastest qualifying time and world's record for the ¼ mile was made by the Mercury Midget powered by DENNYMITE to win the Mathew's Time Trophy. Official Time: 16.4 seconds for the ¼ mile.

NEW "DELUXE" MERCURY MIDGET
New "De Luxe" Racing Car—Rear wheel drive—All metal body complete, prefabricated, machined and polished, ready to assemble—Drive unit gears run in oil in totally enclosed housing. Kit (less flywheel and motor)..... $23.50 postpaid

ORIGINAL FRONT DRIVE CAR KIT
Original Front Drive Racing Car Kit, case hardened steel gears completely enclosed in aluminum housing, cast aluminum frame and all materials necessary, including detailed plans for constructing body. Kit complete..... $19.50 postpaid

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SUPER STREAMLINED MODEL RACER KITS

The Super Five!

THRILLING to build and own!

Kit 102 "Super-Five" Deluxe 9¾" $1.00

It's fun to build this "SUPER-FIVE"! Accurately scaled from original. Carved inside for drive shaft, foot pedals and instrument panel. Tail block and cowling cut to shape. Cement, 3 vials colored dope, 2 ft. aluminum tubing for exhaust stacks, bamboo reed, wire. Scaled Offenhauser motor. 1-15/16 rubber tire wheels. Shipping and packing charges 15c.

EXTRA

Other fine kits at 10c, plus 10c shipping charges — and the SILVER FLASH deluxe, with parts, for 35c plus 10c for shipping.

25c SPECIALS

Kit 76 "Lucky 5" A winner

Kit 75 "Silver Flash" 7½"

Both of the above have body block cut to shape, with holes drilled, turned wheels, celluloid windshield; material for springs, axles, pans, tie rods, steering rod, cement and 2 vials dope. A world of fun for 25c plus 10c for shipping!

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WE ARE OFFERING 3 HAND CARVED PROPELLERS
AT AMAZINGLY LOW COST
Packed in attractive boxes, you will receive a
9 ply laminated propeller
5 ply laminated propeller
Gumwood propeller
Completely finished

9"—$ .80 for 3 propellers
10"— .85 for 3 propellers
11"— .90 for 3 propellers
12"— 1.10 for 3 propellers
13"— 1.15 for 3 propellers
14"— 1.20 for 3 propellers
15"— 1.60 for 3 propellers
16"— 2.40 for 3 propellers
18"— 2.10 for 3 propellers
POLISH FIGHTER GAS KIT—47"
only $2.50
Please add 10c for postage
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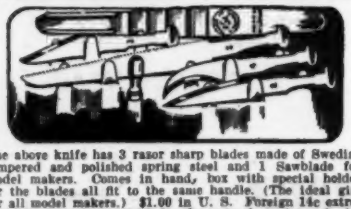
MODELER'S KNIFE



The above knife has 3 razor sharp blades made of Swedish tempered and polished spring steel and 1 Sawblade for model makers. Comes in hand, box with special holder for the blades all fit to the same handle. (The ideal gift for all model makers.) $1.00 in U. S. Foreign 14c extra. We have 14 styles of blades for arts & crafts, schools, students and sportsmen. A well-made knife. The blades do not break.

NILS SEAHOLM 139 Kingsbridge Rd., Dept. MA Mt. Vernon, N. Y.

contests that are being held in the area. Many spectators attend the contests. Many eventually become model builders. All meets held by the Allegheny Mountain Area Group are open to all model builders, and it may be truthfully said that larger crowds are turning out than has ever been seen at a model meet in this section.

On August 27th a fourth meet was held and it attracted a large following in that entries from the entire area were competing for the honors. To start the day off auspiciously John Eberlee of Unit One, IGMAA, launched a Brown-powered "Zipper," for the first official flight, and the plane flew out of sight in a cloud after nineteen minutes and six seconds of clocked flight. It has been reported that the plane landed in a farmer's yard at quarter to three after having taken off the field at twelve-thirty.

A further highlight of the day was provided when one of the mechanics from Warren, Ohio, was in pursuit of the wrong ship . . . and was his face red. The final results of the day's efforts are listed as follows:

GAS POWERED

Open—	*Average*
Eberlee, John	382 sec.
Willard, LeRoy	85.5 sec.
Hall, F. M.	81 sec.
McKinley, George	59.96 sec.
Mander, Lou	51.83 sec.
Jr.-Sr.—	*Average*
Bila, Peter	169 sec.
Blair, William	157.6 sec.
Sadesky	84.6 sec.

FUSELAGE

Open—	*Sr.—*	*Jr.—*
Everett, Rich.	Richards, Geo.	King, Wm.
Thomas	Boyle, Geo.	Mihalik

STICK

Everett	Bila, Peter	
Moran	Boyle, Jos. V.	Mihalik

GLIDER

Moran	Saunders	King
Everett	Boyle	

The contestants were well pleased with their day's efforts.

Jersey City

Richard McNally, secretary-treasurer of the Jersey Airsquires of 60 Cambridge Avenue, Jersey City, New Jersey, writes and tells us that the first gas model club in this section was organized August 1st at the home of Kenneth Goldberg. The club, consisting of eight members, elected Andrew C. Eggers as president and McNally as secretary-treasurer. In the near future they will become units of the various national gas model organizations. Plans have been made to enter the gas meets in the New York metropolitan area. Meetings will be held semi-monthly and due to the interest of each member, a worth while program will surely result. The members will strive for recognition and prestige as "The Jersey Airsquires."

Chicago

On Sunday, July 23rd, 1939, the American Gas Model Airplane Meet was staged at Hines Hospital Airport from noon to 5 p.m. This meet was sponsored by Aviation Post No. 651 of the American Legion and conducted by the Chicago Park District. One of the main features of the meet was that contestants could enter free of charge.

There were three big events—Models under 45 inch wing span; models with 45 inch up to 85 inch wing span; and models with 85 inch wing span and over.

Thirty-six prizes were awarded and they consist of large trophies, miniature gas motors, gas model kits and other valuable prizes.

It was a great air show for the 1,300 disabled veterans and the 3,000 spectators, according to Col. Hugh Scott, head of the Hospital, and John R. O'Connor, Recreational Director. The American Gas Model Airplane Meet was organized and directed by Joseph J. Lucas, who is well known as a model aviation authority and model flyer.

In addition to the three big events, a four-cycle engine contest was held and John B. Rathbun of "Popular Aviation" gave a beautiful trophy for winning total duration time made by a miniature four-cycle model airplane under the rules and regulations governing all events of the meet. This is the first time that an event has been conducted for the newly-experimental four-cycle engine for model airplanes, and there were five entries.

It is of interest to know that the airlines played an important role in helping to make the meet such an outstanding contest. Beautiful trophies were received from United, American, Pennsylvania-Central, T.W.A. and Braniff Airlines, as well as a large trophy from "Popular Aviation" and two trophies from the "Chicago Daily Times." Prizes in addition were: Aviation luggage from Eastern Airlines; gas motors from Junior Motor Corp., Forster Brothers and Aviation Post No. 651 of the American Legion. Gas model kits and accessories from

Megow, Scientific, Aircraft, Comet, Aero-Spark Company, Bob Roberts and Commander Simpson. In addition to the above donors all contestants had free oil (Polarine 70) donated by the Standard Oil Company. Also magazine subscriptions from MODEL AIRPLANE NEWS and an airplane ride from Jack Vilas, Early Bird flyer.

Two of our well-known airline pilots, Walt Addems and E. P. Lott, who are connected with the United Airlines, took the day off from flying their airliners and their specially designed gas model airplanes at the meet. They made an excellent showing in the Open Class Event B, finishing fifth and sixth respectively, which goes to show that gas model designing, building and flying is not only for the young boy but also for the business man.

Baltimore

William W. Saunders, senior advisor of the Baltimore Model Airplane Association of 4303 Kathland Avenue, Baltimore, Maryland, sends us the following report of his club's activities:

"The contest, which was sponsored by ourselves, was the largest of its kind ever held in Baltimore. We had 110 entries with approximately 150 planes, both gas and rubber. We distributed 115 prizes. (We combined some.) First place in two of the events was a gold trophy and a gasoline motor in each.

"Without the presence of a single thermal current the best average time for 3 flights was over 4 minutes. First place in the rubber event went to T. Davis of Baltimore: 1st place in small bore gas went to L. Buchanan of Pottstown; 1st place in large bore gas event to Robert Wiehle of Washington. We paid for all expenses of the meet and put $175.00 in our treasury. We believe that every one had a swell time with the unlimited number of official flights which we allowed them."

Linden

Mr. Frank M. Krysiak of the Linden, N. J., Recreation Commission, sends us a report of a contest held recently:

"Arthur Scheid, 31-year-old model builder of Wood Ridge, New Jersey, won the second annual New Jersey State Gas Model Airplane Championship at Hadley Airport on July 29th. In winning he established a new meet record of 11 minutes, 8 seconds for a single flight. The model flew out of sight on this record flight. His total time for the three flights was 19 minutes, 9 seconds. The previous record was made last year by Arthur Gray of Plainfield, the defending champion, who finished eleventh this year. His record was 4 minutes.

"Scheid was awarded the Jasco Trophy and a Brown B motor. Additional prizes awarded were: Baby Cyclone and Ohlsson 23 motors, four gas model kits, subscriptions to model airplane magazines and model accessories.

"Robert Weston of Fairlawn, New Jersey, was awarded a special prize for his unique and original design of a tailless model. The so-called "Flying Wing" was very stable and proved to be a consistent flyer.

"Flying conditions were none too good due to a strong wind and cloudy skies, but flight records were much better than in 1938. New Jersey contestants carried off the majority of awards, taking eleven of the first fourteen places. There were many contestants from Connecticut, New York and Pennsylvania. The open event was the only one contested.

"The meet was sponsored by the Linden Model Aircraft Club and was sanctioned by the N. A. A. Frank M. Krysiak was the contest director and was assisted by Russell Hilts, Miss Mary Walker, Miss Phyllis Hilts, Silvio Colletti, Al Shukis, Harry Kurtz, Edward Gross, Henry Stalowski and Lloyd Kingsly. The New Jersey State Police provided police protection. Timers were assigned by the Linden Recreation Commission."

PHANTOM HOLDS WORLD'S AIRPLANE Record
PHANTOM HOLDS WORLD'S SPEED-BOAT Record
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SPECIFICATIONS
.171 H. P. at 8000 R. P. M.; Displacement, .275 cu. in.; Static thrust, 30-32 oz. av.; Dowmetal diamond-bored case; one-piece counterbalanced shaft with rotary valve integral; hardened steel timing cam; oversize bronze bearings; runs upright or inverted.

M11

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Add 3% Sales Tax for delivery in California.
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Mansfield

The Frank Lahm Cadets of Mansfield, Ohio, held an airplane contest at the Municipal Airport on August 20th.

Weighing in and checking the ships started at 10:00 a.m. and continued till about 12:00. Thirteen gas models were weighed in and several more were on the tarmac. Thirty other models were entered in the glider and rubber power events. There was a strong wind all afternoon, which made flying almost impossible. A few gliders and rubber powered models flew, however.

About 5:45 p.m. the first gas model was launched into a very slight breeze. Only the two first place winners completed their three official flights. Some cracked up and others didn't take the chance.

E. H. Bielstien, who has won for the

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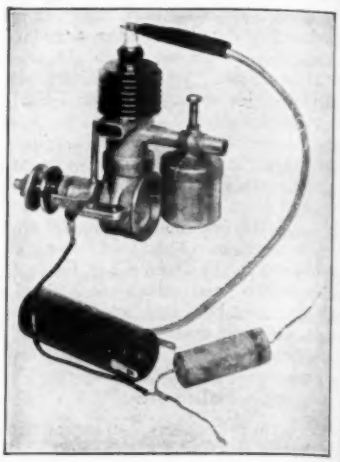

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last two years, had two gas models flying. His "Monowheel Special" with a retractable landing gear crashed when it failed to pull out of a loop after taking off.

Roland Poth's model crashed when it stalled close to the ground. However, he took grand prize with two firsts and one second.

Harold Heston's Taylor Cub came in for a perfect landing but the wing caught on some brush and broke at the mid-section. His "Cloudster" powered with an Ohlsson "23" crashed after making three vertical turns.

Raymond Dewitt's Comet Clipper, powered with a Brown "B," crashed in same manner as Heston's "Cloudster."

GAS MODEL

Name	*Model*	*Motor*	*Fuel*	*High*	*Aver.*
Joe Bertha	Comet Clipper	Syncro Ace	3/16	4' 48"	3' 30"
Mr. Buss	Comet Zipper	Brown "B"	1/8	3' 13"	2' 07"
H. Heston	Peerless Cub	Brown "B"	3/16	1' 50"	1' 50"

RUBBER POWERED DIVISION

Name	*Wing Area*	*Wgt.*	*High*	*Aver.*
Roland Poth	120	3.6	31"	28.3"
Ben Gerhart	145	4.5	27"	25"

FREE-FOR-ALL

Name	*High*	*Aver.*
Broncho Petrovic	22"	22"

FLYING SCALE

Name	*Model*	*High*
R. Selwyn Copeland	Plymacoupe	19"

HAND-LAUNCH GLIDER

Name	*Wing Area*	*Wgt.*	*High*
Roland Poth	66"	1-5/16	30"
Mike Petrovic	50"	1-1/16	28"
Merritt Caton	50"	1	24"

DETAILED SCALE

Name	*Model*	*Points Out of 100*
Mike Petrovic	Stinson SR7	76.33
Roland Poth	Mr. Mulligan	74.66
John Foster	Boeing F4B4	72.33

Dallas

John E. Clemens of Dallas, Texas, P.O. Box 2063, reports on a contest recently held in his district:

"The contest held July 30th at Hampton Airport in Dallas, Texas, was sponsored by the Junior Chamber of Commerce. It was directed by the Dallas Gas Model Association and bore the sanction of N.A.A. and the Southwestern Gas Model Association. Mr. F. W. Cale of Dallas acted as Contest Director and was ably assisted by members of the Dallas Club and the Junior Chamber of Commerce Aviation Committee.

"The weatherman blessed the contest with a perfect day. There was an average wind of four to eight miles an hour on the ground. Thermals were the most abundant I have ever seen at a contest and resulted in the loss of twelve models. This was mostly due to a stronger wind above 2,000 feet.

"All contestants and spectators agreed that the efficiency with which the events were run off was a thing to marvel at. The first event of the program after registration was for the Appearance Award. First place and $10.00 went to Rogers Barton of Temple, Texas, who entered a beautiful all-white ship. Second place and $5.00 went to J. B. Brown of Fort Worth, Texas. Several models were adjudged more beautiful than these but failed to make their qualifying flights, it being necessary for them to make an official flight within five minutes after being called.

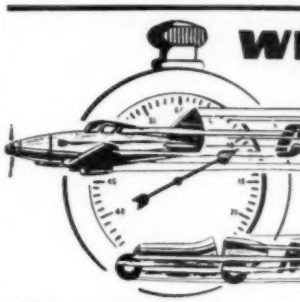
"The Stunt Event proved to be the most interesting part of the program with some truly astonishing tricks being pulled off by the models. First place and $10.00 was won by John Clemens of Dallas. Second prize and $5.00 was awarded to Mr. and Mrs. Robert Connell of Houston, Texas. In winning this event Clemens' Comet Zipper, powered with a Brown "D," carried a six-ounce smoke flare and laid a very dense smoke screen over the airport. Second place was awarded for a very nicely executed pick-a-back flight made by models belonging to and flown by Mr. and Mrs. Connell. Other notable flights in this event were another pick-a-back flight put on by Orin Anderson of San Antonio, Texas, a parachute drop engineered by Willie Ng of San Antonio and some bomb dropping by Tommy Givens of Graham, Texas. Another model flown by a Wichita Falls entrant flew out of sight towing a small banner.

"The special Women's Event which was included in the Limited Motor-run Event was won by Mrs. Betty Fisher of San Antonio. Second place was take by Mrs. Jimmy Peterson. There were ten active women entrants in the meet.

"In the Dallas Penguin Derby all models were lined up in a straight line facing into the wind. At a given signal all motors were started. After a five second warning signal a bomb was fired and all models took off simultaneously. The first model to turn and cross the finish line 100 feet down-wind was declared the winner and this proved to be Gene Hartmangruber of San Antonio. The second place winner was Robert Connell. Prizes in these last two events were $10.00 for first and $5.00 for second.

"Of course the most important events of the day were for Limited Motor-run competition. In the combined Class A and B Limited Motor-run flights, Rupert Jones of Dallas won first with an average time of three minutes, 18 seconds. Second was won by Bob Hines of Cleburne, Texas, whose average was three minutes, seven seconds. Both of these models were Comet Mercurys powered with Ohlson 23's and both were lost on the first flight.

"In the Class C Limited Motor-run Event there were 152 entrants. All those winning prizes had at least one flight which flew from the sight of the timer."



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Fundamentals of Model Plane Design

(Continued from page 21)

$$(100) \times (1),$$

or $L = (0.01384) \times (150) = 2.076$ ounces.

Thus the lift on such a wing will be 2.076 ounces.

How Speed Is Calculated

When designing the propeller for a gas engine model, it is very important to know the speed of the plane. In this respect the above formula is very important. The airplane's normal flying speed may be calculated quite accurately by sustituting in the formula for the actual numerical values of L, A, I, H_u and H_b and then solving for V, the velocity. The answer will be in miles per hour.

Suppose for example that we calculate the speed of the famous KG gas engine

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powered model by means of the formula.

In this case, L equals the weight which is 104 ounces. A equals the wing area in square inches. The wing has a span of 8 feet and a chord of 1.33 feet or 15 inches. The area, therefore, is 10 square feet, allowing 0.4 square feet for the cut away wing corners. Then A = 10 x 144 or 1440 square inches. The angle of incidence I = 3 degrees. H_u the camber of the upper wing surface, squares 2.15. The camber of the under surface is about 0.45 inches downward, and therefore it is negative or minus 0.45.

Substituting these values in the formula we have:

$$104 = (0.002)\left(\frac{(3)\ 2.15 - 0.45}{4\ (15)}\right) 1440\ (V^2)\left(\frac{3+3}{6}\right)$$

Simplifying, we have:

$104 = (0.002)\ (0.1)\ (1440)\ (V^2)\ (1)$.

(In the equation above (0.1) is the camber factor value.) Then,

$$V^2 - \left(\frac{104}{(0.288)}\right) = (361.7).$$

or, $V = \sqrt{361.7}$, or V = 19 miles per hour.

In this case the speed in normal level flight required to sustain the model is therefore nineteen miles per hour. Actually the model will fly about three miles per hour faster due to the extra power of the engine over the amount that is required to just keep the model flying horizontally. Usually this reserve results in *climb*.

The speed of rubber powered models may be calculated by following the same procedure.

Graphical Method of Determining Speed

A graphical expression showing the relationship between the values composing the formula just explained is given in the graph appearing on page 21. By means of this graph the lift, the speed, the weight or the wing area may be determined without the necessity of solving the formula. This method is very convenient if you are adverse to mathematical solutions. Of course if numerical values are involved in your problem, outside of the limits of those encompassed by the graph, it will be necessary to make use of the formula in order to solve your problem.

In order to illustrate the use of the graph the following example is given:

It is necessary to know the speed of a rubber driven plane of the following specifications: The wing area is to be 202 square inches (or 1.4 square feet), it will weigh, when completed, 8.4 ounces or 6 ounces per square foot. The wing is to incorporate the Grant X8 section, which is to be set at an angle of incidence of 3°. (3° measured relative to the line of thrust.) The camber factor of this section is given in the table shown in the article of this series which appeared in the October issue, page 36. It is 0.0777. These are all the facts you have to know in order to determine the minimum level flight speed of the model.

Now let us examine the graph, Fig. 13. The camber factors are indicated on the left side of the graph. Note the point at which the value 0.0777 is located. Next pick out the vertical line which represents the value of six ounces per square foot, indicated at the lower edge of the graph. Now follow across to the right horizontally from the point repreesnting the camber factor value, until the six ounce per square foot line is intersected. The intersection will lie about half-way between the second and third diagonal lines.

Now follow upward along a line half-way between these two lines, to the table of values for various speeds. In the three-degree angle of incidence column you will note that diagonal line two intersects it at the value of sixteen miles per hour and the third diagonal meets it at the seventeen mile per hour value. Thus as the intersection point of the camber factor and the wing loading value is located half-way between these two lines, the correct value of the speed will be helf-way between sixteen and seventeen miles per hour, or 16.5 miles per hour. This, therefore, is the minimum level flight speed of the airplane of the given specifications.

If the speed of the plane is known and you wish to know the lift that the wing will generate at this speed, the process may be reversed in order to determine the correct answer.

For instance suppose your airplane is to fly at nineteen miles per hour and it is to incorporate a Grant X8 wing section. First find the nineteen miles per hour diagonal line and follow along this line downward until it intersects the horizontal line passing through the camber factor value of 0.0777. You will find that the intersection lies on the vertical lines which represents a wingloading of eight ounces per square foot. This will be the wing loading of your plane. Now if the wing has a total wing area of six square feet, the total lift at nineteen miles per hour, at a three degree angle of incidence, will be forty-eight ounces or four pounds.

You should find this chart extremely useful in solving your problems once you have mastered the procedure.

Taming the Speed Demons

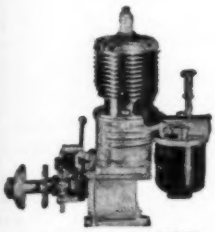
(Continued from page 7)

made for preheating the air intake.

For racing, the internally braced monoplane has the edge over any other type. The mid-wing, or wing coming into the middle of the fuselage, has the least air resistance but brings up difficult problems of fuselage structure, retracting landing gear design and pilot's vision. The mid-wing location provides some blanketing of the tail surfaces for decreased stability and controllability and sometimes causes an air buffeting or hammering on the tail. With proper fairing and filleting, the low wing location is only slightly unfavorable in air resistance but this is much more than offset by its other advantages. Both the landplane and seaplane speed records have been held by low-wing monoplanes for many years.

It has always been a great temptation to build wings about the size of postage stamps and let the landing speeds go dangerously high. The small size as well as the high speeds makes these airplanes quicker than "greased lightning" in their every maneuver. It is an excellent way of asking for crashes and emphasizing deadly flying instead of intelligent design.

1940 "O.K." Models 1940



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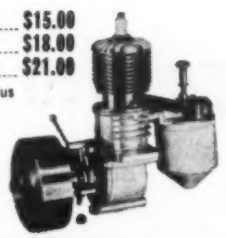

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Some reasonably minimum permissible wing area, such as 75 square feet, would give our ambitious youngsters a better chance of growing older. For the larger racers the maximum wing loading (total weight divided by wing areat) could be graduated upward to not to exceed fifty pounds per square foot. Landing speeds could very well be held to 90 m.p.h. because with proper design the gain from exceeding this figure is negligible. Some sort of wing flaps, slots or auxiliary lift system should be used to reduce landing speed, steepen the gliding angle and reduce "floating" across the field. On the low-wing jobs a good trick is to bring the wing flaps in to the middle of the fuselage to avoid the loss of lift from air spilling around the inside ends.

The wings should be tapered in both chord and thickness to end in a thin elliptical tip. They should not be too thin because of the great increase in weight to obtain necessary strength, also the lack of rigidity would contribute to wing flutter. Racers should be definitely stable but not highly so since extra power would be required to whip them around the pylon turns. The usual amount of dihedral with a tapered wing racer is to have the line of highest points on the top surface perfectly level which puts a dihedral angle in the bottom surface. The tips should be turned slightly upwards and twisted to several degrees less incidence, the amount varying somewhat with the airfoil section used. This increases lateral stability, decreases wing tip stall and has less air resistance at high speeds.

Sweeping a tapered wing forward or backward affects its efficiency only slightly. The main thing to consider in this respect is how the wing will best fit into the rest of the design. The swept-back wing should have the better handling characteristics and the landing gear attachment should be simpler and easier. For a racer the most efficient aspect ratio (wing span divided by average chord) should be about five to six, varying somewhat with wing thickness, structure and airfoil.

Wood wings with a plywood cover are ideal because they are inexpensive and can be given a finish so slick that even a fly would skid off. Laying the plywood diagonally will give greater strength and rigidity. The smooth surface is necessary for the least air resistance at high speeds although at 100 m.p.h., rivet heads or even corrugations make little difference.

Racers should be built to withstand a load of about twelve times normal gross weight. Calculating the strength of all parts will require someone with engineering experience although the data and calculations need not be as elaborate or extensive as is required for military or commercial approval.

It does seem ridiculous to carefully calculate the strength of an airplane and then not give the pilot some instruemnt to tell him how much he is straining his airplane in violent maneuvers. Instrument manufacturers have been selling accelerometers for $100 each but anyone can quickly and easily build their own. All it takes is a glass tube set vertically, inside that a steel ball on top of a light steel spring. It is calibrated by marking off the amount the

December Issue on Sale Nov. 8th

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steel ball normally depresses the spring as one "g" or one times the pull of gravity or normal weight. Mark off equal distances on the glass tube for each extra "g."

The same principles apply to all the control surfaces, ailerons, elevators and rudder. The best design is light metal alloy fabric covered. Sufficient lead weight should be attached to the leading edges of these surfaces so that on the ground they will balance on their hinges. There should not be over twenty percent of the area of these surfaces in the counterbalance ahead of the hinges; and in many cases less or none for otherwise the controls will move too easily and there will be no "feel" left in them for the pilot. Aileron and elevator control should not be by cable but preferably by push and pull tubes. Torque tube controls have too much spring and flexibility. Cables are okay for the rudder since the pilot ordinarily holds pressure on the rudder pedals, but it is still a good idea to tie these pedals down with a spring loading.

The fuselage shape first of all completes the engine streamline. Then it should match into the wings and tail surfaces with a minimum of added air resistance from the interference between the airflows about various parts of the airplane. This is one of the most important parts of any airplane design. Although most of them will not admit it, even our smartest engineers have plenty more to learn on this subject.

In the fuselage as well as everywhere else about the airplane, all equipment and controls should be readily accessible for inspection and repair. It should be possible for one man to remove all cowlings and inspection plates in less than five minutes using no tool but a screwdriver. Trying to build too small a fuselage means cramped and inaccessible installations and gains but little if any in top speed. In racing designs the wheels must almost invariably retract into the fuselage because the wings are too small and thin. In many cases the oil tank and much other equipment can best be placed behind the pilot to provide more room ahead and to improve the airplane balance.

The cockpit should not be cramped for the pilot, but instead, he should have room enough to wear a parachute and plenty of freedom of movement to easily handle the controls. The windshield should rise nine inches, or preferably more, above the cowling line or any forward part of the airplane so as to provide decent vision. Whatever type of cockpit cover is used should be arranged to be quickly and easily opened from inside without any possibility of its being jammed in its tracks. Ventilators should supply fresh air to the cockpit to help keep out all fumes and keep the pilot cool in spite of the hot air coming back from the engine. With such a cockpit the pilot can do a better job of flying a race and much more than make up for what little might be lost in the straight-away top speed of the airplane.

The fuselage material and construction can be whatever is desired. Riveted duralumin monocque is light in weight and the rivet heads give little added air resistance behind the propeller and engine. Plywood monocoque is the lightest and fastest but the most dangerous in a crash. Welded steel tubing, fabric-covered, is perfectly okay and easy to build but it is somewhat heavy. The front of the fuselage back to the trailing edge of the wings needs to be either metal or plywood covered because fabric will not stand the punishment.

The design of tail surfaces should be very conservative because here are golden opportunities to give the airplane mean handling characteristics or to send it out to crash. The further back and higher the horizontal tail surfaces can reasonably be, the more they will avoid air buffeting and blanketing from the wing. Fuselage and rudder area beneath the horizontal tail surfaces are the greatest single aid to good spinning characteristics and good handling on the pylon turns. The tail surfaces should be of ample size to begin with and then there should be definite plans to increase or decrease them as indicated by actual flight tests. Tail surfaces should not be too thin because they then become too subject to flutter or vibration.

The horizontal stabilizer can best be solidly fixed since it is difficult to keep an adjustment tight and entirely free from vibration. This stabilizer should be given a built-in angle set for level flight top speed. Then the elevators need to be very nearly the same area to drive the tail down on landings. The stabilizer and vertical fin can very well be built of wood but in any case should have a plywood or metal covering. The vertical fin should be built very strong to withstand a crushing load should the airplane be nosed over on its back on

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landing.

Retracting landing gears are a necessity for the ultimate in speed but it is a prize headache to design a good one. If used at all, they should be strong and foolproof and retract completely, easily and quickly, leaving only a smooth surface behind them. Whatever method is used will have to be kept in mind from the very start of the design and will control plenty of other things about the airplane. The landing gear should be low so it will be easy to make a three point landing or even to land the tail well below the wheels. This is also a big help in avoiding ground looping tendencies.

Many racers have been cracked up because they used tires about the size of doughnuts with no other shock absorbing or snubbing mechanism. A low enough minimum standard would be tires of five inches cross sectional diameter plus a snubbed shock absorber travel of four inches. For landing on turf or dirt, a non-steerable tail skid is best because it aids braking and prevents ground looping. If the racer is to be landed on paved runways, a locked tailwheel of rubber without air inner tube should be used. Wheel brakes are a necessity and individual hydraulic control to each rudder pedal is the simplest, best and most expensive to install.

The airplane should be completed a long time before it is supposed to be raced so there will be plenty of opportunity to make whatever changes and adjustments are necessary. The pilot should do a lot of practice flying with his racer to become quite familiar with it, particularly on pylon turns. Each pilot in any race should be required to wear a parachute and that would still be fair competition for everyone.

A lot of our racing airplanes have always been hauled overland, usually by trailer specially built for them, to every race meet where they have competed. It does seem that the owners should have what little personal pride it should take to bar such a comical procedure. If any airplane is not a fairly practical means of transportation, there is no excuse for its existence, so it should be thrown on the junk heap where it belongs. A fair enough requirement would be to have all racers fly in non-stop from a point at least 250 miles distant.

The few of us who have been racing for years and who are left have seen very many of our friends killed and so many airplanes needlessly wrecked. The greater tragedy is that at least nine-tenths of this death and destruction should have been avoided by intelligent engineering. While regulations have been kept entirely too free and easy in order to encourage originality of design, it is more than ever up to each individual's conscience to build safety into his own racing airplane.

Folding Away the Drag

(Continued from page 11)

of attack of approximately 4° and glides most efficiently at an angle of attack of approximately 8°.

Fig. 1 illustrates the obsolete method of attaining this adjustment; with free wheeling or feathering propellers, by the use of "down-thrust." The model when adjusted for a good glide would show stalling tendencies under power, especially under the initial burst. The reason being that the model was trimmed for a good glide (8° angle of attack) and was being flown under power with the same adjustment, therefore the stall. To remedy the stall down-thrust was applied to add a slight downward pull on the nose sufficient to bring the model down to a good angle of attack for powered flight Fig. L (a). This increase in down-thrust increased the friction and lowered the R.P.M. after the power ran out, the downward pull on the nose vanished, allowing the nose to rise again, whereupon the model assumed an angle of attack best for gliding. However, this adjustment besides adding excessive friction also proved erratic, due to the variation of the power output of the rubber motor and in turn the variation of the downward pull of the down-thrust. This variation made it tedious, difficult, and sometimes impossi-

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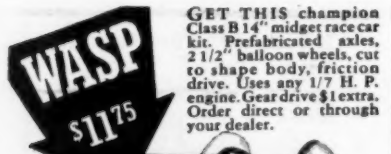

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Rockefeller Organizes Air Youth of America

ORGANIZATION of Air Youth of America, a national agency to assist the 1,500,000 to 2,000,000 youths already participating in junior aeronautics and to stimulate further developments in this hobby-sport-training, was announced Sept. 21st by Winthrop Rockefeller, son of John D. Rockefeller, Jr.

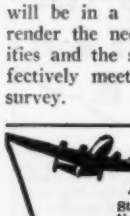
"After a year of intensive study, our survey appraising youth activity in aeronautics was recently completed," Mr. Rockefeller said in his announcement. "This survey reveals some interesting trends in youth life in America today.

"Youth on its own initiative has taken up model building on an extensive scale, exhibiting in addition a real interest in the scientific aspects of aeronautics. This constructive leisure-time activity is not only educational in reference to aviation, but also calls upon those qualities of patience, precision and fair play which serve to build a more high-minded and stable citizenship.

"Our survey not only emphasizes this widespread interest, but also reveals that guidance in this field is sporadic and inadequately supplied with the advanced information necessary for strong leadership.

"The organizing committee, therefore, has decided that a central agency should be formed to make readily available information on the best practices in all sections, to establish standards and to furnish a source of inspiration for further development."

To develop a non-commercial, non-profit, civilian organization supported by private subscriptions and nominal service fees, the organizing committee has begun enlisting members of a permanent council of twenty-four. The Council of Air Youth, with headquarters at 30 Rockefeller Plaza, New York, is setting up the organization which will be in a position later in the fall to render the necessary clearing house facilities and the services which will most effectively meet the needs indicated in the survey.



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(Continued from page 59)

ble to obtain a smooth powered flight free from stalls with a good glide at the end.

By using a folding propeller this difficulty is practically eliminated. The model is adjusted for powered flight, which in these days of high power is a great deal safer. (Fig. 2a.) Then after the power dies out the blades fold back, moving the C.G. back slightly. This causes the tail to be lowered, which automatically increases the angle of attack to a degree where the best glide is attained. (Fig. 2b.) This arrangement has no opposing forces which pull against each other. This simple, fool-proof, automatic power and glide adjustment makes an ideal arrangement which should prove of value to every model builder.

We would like to state that a folding propeller does not totally eliminate downthrust, because to obtain the necessary stable force arrangement down-thrust is a necessity in some model designs which are the result of errors in basic form. Aerodynamically correct designs do not need to employ "down-thrust" at any time.

From a practical standpoint a folding propeller has another prime advantage, almost comparable to the decrease in drag which it brings about. That is the fact that folding propellers are almost non-breakable. "Impossible, no propeller is non-breakable," you say. There you are wrong, because despite the fact that a folding propeller has a hinge on each blade it is much superior to a solid propeller. When a folding propeller comes in contact with an object during flight the blades fold back upon the impact, thus the shock is absorbed and transferred to the rest of the ship instead of the breaking of the blade absorbing the shock. True, a folding propeller can be broken, no material is infallible, but its chances of surviving an impact are much greater than when a conventional free wheeler, or feathering propeller is used.

A model equipped with a folding propeller has another advantage of note. It is a well-known fact that the rudder is more effective under power than in the glide (because of the propeller stream.) However, when a folding propeller folds back the lateral area the blades presented disappears. This causes the center of lateral area to move back somewhat, which makes the rudder more effective because there is less area forward to resist the action of the rudder. The rudder being more effective in the glide makes it easier for the builder to adjust the amount of turn in this part of the flight.

In this article we not only endeavor to show the reader the superior points of the folding propeller, but also to show the best type of folding propeller. It is only natural with the large number of model builders in the U.S. that a new idea would be developed a number of different ways. Wallace Simmers was one of the first to ever use a folding propeller and he has used this system for over two years. We believe his system to be the simplest, most effective and fool-proof type yet devised. Fig. 3 gives a good idea of the construction, which will be discussed later. This type folding propeller is known as the "free folding" type. By that we mean that it folds freely through forces which we shall explain. There are no springs, catches, rubber tensions or other useless doo-dads to tinker with; the reason being that they are absolutely unnecessary. Every gadget added is just something else to go wrong under contest stress. How many times have you seen a contestant with a ship fully wound and ready to launch stop and tinker with some free wheeling or other doo-dad, while his rubber goes dead and his nerves get frayed. Or see another contestant attempt to set a free wheeling arrangement and have it slip or break, cutting fingers and model to pieces, whereupon another valuable half-hour must be spent making repairs and another long wait be endured to get a timer. Under contest stress it is imperative that practical, strong and "sure fire" methods be used. With this goal in mind "Wally" gradually devised this propeller for its simplicity is evident, and if built with care its strength is remarkable.

The blades are kept in place during powered flight by the thrust they develop. Therefore all that is necessary for launching is to release hold of the center hub of the propeller a fraction of a second before releasing hold of the model itself. When the power is exhausted centrifugal force causes the blades to remain out for a moment and revolve in the air stream. When the propeller has revolved sufficiently to

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draw up whatever rubber slack you use, and the force of the resistance of the rewinding rubber equals that of centrifugal force, revolution ceases and the airstream forces the propeller blades to fold into position. This action takes but a second or two. The airstream keeps the blades folded, and with the release of centrifugal force the slight twist of the rewound rubber causes the blades to stop against a landing gear leg, a piece of wire for the purpose, or the deep side of the fuselage. Thus all in one simple operation a number of problems are solved: (1) Drag is decreased (2) Adjustment made easy (3) Rubber slack is taken up. What could be simpler, more practical or more efficient?

Now for a few helpful hints on construction: With the high power used today (upwards of 48 strands of 1/8" have been used on a Wakefield equipped with a folding propeller), it is of major importance that everything be as sturdy as possible.

(1). The tubing which is the axis about which the blades fold should be absolutely perpendicular to the center line of the propeller blades. A good folding propeller has the two tips fold and meet perfectly even.

(2). Tubing and wire should fit perfectly to prevent wobbling.

(3). For maximum strength apply glue in small quantities at a time, but give numerous coats. This glue skin should cover the entire hub and past the thread bindings on each blade.

(4). Solder all wire and tubing joints and make them good. Glue does not hold metal together.

(5.) After the hinge is on good and solid and DRY, give the entire arrangement a coat of wood filler and sand smooth.

(6). Then and then only should the blades be cut. Use a sharp razor, not a saw.

(7). Give the edges where the cut was made another coat of glue to prevent fraying.

(8). Remember 30 to 40 strands of 1/8" carries a wallop, so make this hinge firm.

It is important that the propeller blades fold along the sides of the fuselage. In nearly all cases this happens without assistance, but occasionally on a diamond fuselage or a very deep rectangular fuselage the blades will not stop parallel to the thrust line. Fig. A shows how to place a piece of wire so that it will catch one blade. As the propeller comes back to fold it is turning in a CLOCKWISE direction, therefore a wire need only be placed on the left side. When the blade comes in contact with this catch the slight twist of the rubber will keep it there. In case one blade tends to fold on the top of the fuselage, and the other dangles down, sit down and carefully think out why the blades do not catch as they ought; then place a wire catch on the fuselage side where it will do the work best. However only in rare cases of peculiar fuselage shapes or landing gear construction does the folding propeller misbehave, then the remedies are simple. So go to it and here's for better thermals!

Now you may ask. "What is the fourth step in cutting down propeller drag?" There is but one solution! That is to fold

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.050.....3 ft. 5c
3/32 dia. 5 ft. 15c
⅛ dia. 5 ft. 25c

PROP SHAFTS, REAR HOOKS
Doz. 8c

TISSUE, AA
All col., doz. 19c
Silver .....ea. 5c
Superfine, wh. 5c

ALUM. TUBING
1/16.....4 for 1c
⅛, ¼, 5/16 ft. 10c
⅜, ½ ft. 15c

BUSHINGS
1/16.....4 for 1c

WASHERS
1 doz. ⅛, or ¼ 1c

CELLULOID
6x8 .....5c
12½x16 .....19c

CAMEL'S HAIR BRUSHES
Small 3c; lge. 5c
Extra large..... 8c
Flat, large.....10c
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Toggle Switch .30
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Booster plug jacks, ea. .10
Battery Boxes
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Penlite, 1¼" .50
Champion Spark Plugs 65c
Alligator Clips .....for 15c
Fernstadt Clips .....each 2c

NOSE PLUGS
¼".....12 for 8c

THRUST BEARINGS, dz. Sm. 10c; lge. 15c

REED
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3/32x⅛....1 ft. 1c

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1/16x⅛ x15, dz. 10c

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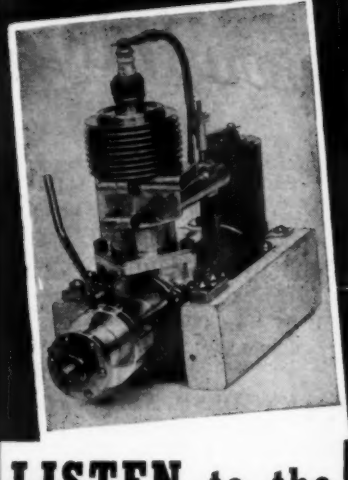

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Bud Sunderman

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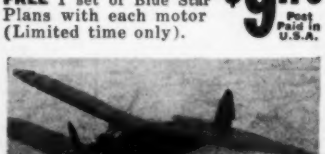

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the blades entirely into the sides of the fuselage. When you have done this you will have a perfect hybrid. A powered model while the power is available and a soaring glider when the power is out and the model is at its highest altitude. This fourth step however is up to you. Every type fuselage will need slightly different construction, but with a little inspiration and day dreaming (plus hard work) the ideal may be reached.

Building the "Power House"

(Continued from page 19)

Construction

In building the Powerhouse the fuselage is the first step. Select a hard grade of 5/16" square balsa. Behind the cabin a softer grade of balsa may be used, for strength will not be needed to such an extent at that particular part. The motor mount bearers are 5/16" by 7/8" hard gum or bass wood, preferably the former. Get the red gumwood if possible; it's better.

Sides of the fuselage at the nose are cut from 5/16" sheet as indicated on the drawings. This is important as it adds to the rigidity of the nose. After the sides are built they are joined as indicated on the top view of the plan. Check the fuselage for alignment at this point. Next the firewall of 1/4" sheet balsa is added as indicated. Following the installation of the firewall, the nose block is added and securely cemented in place. After thoroughly dry, the nose block may be carved to shape.

Inasmuch as the nose construction of the ship is the recipient of most of the shocks of flying, it is important that cementing at that part of the fuselage be very thorough. At least three or four coats of cement should be given at each joint, allowing at least fifteen minutes of drying between each coat.

Following the installation of the nose block, the formers are added to the fuselage. While they are drying, two pieces of 1/16" by 3" by 7" balsa are cemented together to form the nose cowling over the formers. After the cement has dried thoroughly sand the fuselage and the nose block smooth. Give the nose block several coats of cement to assure a smooth finish. This is important as balsa alone is a notorious absorber of gas and oil. Should you skip this step, your nose block and construction will soon become saturated with gas and oil and cement will eventually loosen, necessitating a complete job of rebuilding.

The next step before covering is the wiring of the Powerhouse. Mount the coil where shown on the plan and construct the battery box as indicated. It is most advisable to use a good quality wire (preferably spaghetti covered) which will not be affected by gas and oil or be subject to breakage under vibration. Always use stranded wire for all connections and be sure that all solder joints are secure and electrically perfect.

It might be advisable to stress, at this point, that one of the most important phases in the construction of the Powerhouse (or any other ship) is the wiring. If the wiring is imperfect you are certain to have trouble no matter how well-built the ship may be in other respects.

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The detailed plans will give you all the measurements for the construction of the landing gear which is formed of spring steel wire of 1/8" diameter. The spreader bar is added after the landing gear is installed on the fuselage.

The construction of the rudder, shown in the article, is entirely self-explanatory and should be comparatively easy.

Covering the windows with celluloid is the final step in the construction of the fuselage prior to covering.

The covering is done in the conventional manner. After the paper is applied, spray the ship with water and let dry. Between each coat of clear dope, sand all surfaces with 10/0 sandpaper. Use at least three coats of dope before applying color dope to the finished fuselage.

Tailor Made Ribs

(Continued from page 11)

(two shaded 100 watt bulbs will give sufficient illumination;) place your camera exactly parallel to it with the lens opposite its center and far enough away that the drawing will not cover more than two-thirds of the negative length. Your exposure may be quite long but for this sort of work it is not critical. If you are in doubt, overexpose. The negative obtained may now be enlarged to any size you desire. Just measure the rib length on your

plan drawing of the wing, adjust your enlarger to give a rib of the same length and either print a picture or make a sketch directly from the projection.

On occasion you will find airfoils accurately printed in books or magazines. If you are photographically well-equipped, you may find it possible to photograph them directly. This saves considerable time but requires a near-focusing device which few of us have. Figure One shows the author cutting out ribs made from photos of the Grant M-2 airfoil, illustrated in the December edition of MODEL AIRPLANE NEWS.

The second method requires that you make an accurate cardboard rib the same size as the smallest rib in the wing which you are to construct. Support the rib rigidly with a piece of balsa wood. Place on one side of it a flashlight with the reflector and lens removed and containing a focusing type bulb. On the other side place a sheet of paper tacked to a drawing board. The flashlight should be placed at the same height as the rib and the rib exactly parallel to the drawing board. By moving the rib back and forth a shadow of any desired size is cast. This shadow may be sketched or its image printed on sensitized paper. This second method, while simpler, requires a small airfoil of very accurate design, although it gives excellent results.

Here's hoping you make them all elliptical and tapered from now on.

A Simple Soarer for Novice or Expert

(Continued from page 9)

to advantage to correctly "learn how." We think that the hochstart and the American way of trimming hand-launch glider models may turn into a good advantage. Flying in a wind has its problems especially if the model is adjusted to circle, for very little rubber tension is required as the model goes up like a kite. An Italian trick to slow up the climb is to tie a small stone to the string near the wire hook. Holding the outside wing low to the way the model circles; or instead of launching directly into the wind, taking about four steps to the right for a right circling model and left for a left turn model, may be of value in wind launching.

In constructing the glider, make cardboard templates of the wing tips, fuselage body, rudder and stabilizer. The wing is made from semi-finished Jasco glider stock. Mark out the tip shape and remove excess with razor. Carefully sand and finish to shape with various grades of sandpaper up to six and ten nought. Glue the wing together and when set rub in two coats of glider polish. Cut out and shape the fuselage body, boom, rudder, stabilizer and its rest. Do not round out the fuselage body top completely but leave it flat where it is joined to the boom. Drawing two lines the width of the boom will help construction. A jig-saw will help cut out the wing slot in the boom. Glue together the body, boom, stabilizer rest and rudder. The boom must be sanded after the gluing. The wing is glued to the boom and then the stabilizer which is slit to fit the rudder. The wire fitting should be securely glued on.

The entire model is now given the final finishing touches, joints like the wing and the body-boom fit should be reglued and everything is polished. Hand-launch the model and correct any turns, diving or stalling tendencies. For balancing the model a section is cut out of the fuselage body and pieces of lead are put in as required. Scotch tape is used to seal the opening.

We used a silver finish on the model and it may be the answer as to what color contest models should be. Red is the present favorite but here is the point for silver: Red powered models have been observed to be all right to a certain point but when it is out of the color range and becomes a diminishing dark spot the flyer looks for the flashing flicker of the polished propeller for guidance. In other words, on long distances it is the flash and not color that is superior, a sort of heliograph effect. It has worked out that way for us anyway and equally well on light or dark background, for we would have lost the model dozens of times, especially in the evenings, if it was not for that flash effect.

And now coming back to the model, hook up the catapult, step back about five paces and release the model. It should climb about seventy-five feet, release and glide straight ahead or perhaps with a turn. Then experiment ahead as you please, but don't forget: In the beginning fly with no wind and little rubber tension. It must be remembered this "hochstart" glider procedure is new and this article

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Full size detailed plan.

★ COMPLETE KIT with finished prop (less Air Wheels) **$3.25.** With M & M 2½″ Air Wheels, **$3.75.** (Plus 20c postage.)

If a motor is purchased with a kit deduct 15c%. Need a new motor? Send in your old motor for an appraisal.

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Ohlsson "23".....$16.50 Husky $12.50
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serves as an introduction. The pleasure of improving the design, flight, stability and performance of this glider branch is left to you, for the author must keep up his reputation for being a lazy fellow.

Frontiers of Aviation

(Continued from page 17)

Vultee and Lockheed. Contracts are as follows:

Glenn L. Martin: $15,815,000 for over 150 twin-engined bombers. These airplanes are not attack-bombers but light bombers and regains for Martin the bomber business that has been held by Douglas for the past few years. They will be larger than the Martin Model 167 attack-bomber now being built for the Air Corps though they may resemble them in some respects. Pratt & Whitney "2800" engines are most likely to be used in the airplanes.

North American: $11,771,000 for approximately 150 light twin-engined bombers that are a development of the NA-40, such a big development that they scarcely resemble it. $2,707,000 for 250 basic trainers and $1,326,000 for 150 advanced trainers which gives North American, as usual, a firm hold on the advanced trainer business though Vultee has become a strong contender.

Consolidated: $8,485,000 for about 40 four-engined heavy bombers, an improved version of the Consolidated B-24 bombers now being built for the Air Corps.

Boeing: $8,090,000 for about 40 four-engined bombers and may be powered by turbo-supercharged Wright radial engines.

Stearman: Primary trainers at $688,-000. However, the company has an option on $2,000,000 more of the trainers. Stearman had to beat the entire sportplane industry to gain the order and must have a good plane to do it.

Vultee: $2,986,000 for about 150 basic trainers developed from their BC-3. The BC-3 is a fine clean-cut airplane and $90,000 worth are being built for the Air Corps. This order for the BC-3 went to Vultee in the first $50,000,000 allotment in which North American also received a contract amounting to $1,659,000 for 92 basic combat airplanes. The powerplant consists of a 550 hp. Pratt & Whitney engine.

Lockheed: $4,845,000 for a reported 44 twin-engined pursuit interceptors similar to the YP-38. Lockheed has designed an equivalent to this airplane, for export purposes perhaps, known as Model 222 with four machine guns and an aircraft cannon in the nose.

$21,865,000 went to engine manufacturers as follows:

Pratt & Whitney: $12,320,000. **Wright:** $7,000,000, **Allison:** $2,275,000 and **Lycoming:** $270,000. The Lycomings will undoubtedly be used on the Stearman trainers and the Allisons on the Lockheed interceptors. It was not stated whether any of the companies would produce flat type engines. We do not like to mention this as it sounds too fantastic, but we heard that Wright was thinking of developing three twin-row engine units into a 42 cylinder engine!

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Machine cut	Paul-O-Wing
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6″ 5c	11c
7″ 6c	16c
8″ 7c	20c
9″ 8c	24c
10″ 8c	27c
12″ 10c	35c
14″ 13c	
15″	48c
16″ 15c	

Wheels per pr.

Birch	Basa	Celu
½″ 1c	3c	
¾″ 2c	4c	5c
1″ 3c	5c	7c
1½″ 4c	7c	10c
1¾″ 6c	10c	16c
2″	12c	20c
3″	15c	30c

Brown Rubber

1/16 15 ft.....5c
¼ flat 15 ft.....5c
3/16 flat 12 ft. 5c
Skeins 225 ft. 70c

Microfilm, Rubber Lube, Wood Filler

.003 sq. ft.....1c
.010 sq. ft.....5c
1 oz. 10c; 2 oz. 15c

Colored Dope

1 oz. 6c; 2 oz. 11c
½ pt.....35c

Cement, Dope, Thinner

1 oz. 5c; 2 oz. 9c

Sheet Celluloid

2x6 2c 5x7 4c
14x17 .....15c

Alum. Tubing

1/16.....6c ft.
3/32, ⅛.....7c ft.
3/16, ¼.....9c ft.

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"American Aviation," well-informed aeronautical publication, states that the attack-bomber contract received by Douglas a few months ago amounts to $14,470,082 for 63 attack-bombers with superchargers and 123 attack-bombers without superchargers. It is said that the planes with the turbo superchargers will have a top speed of 395 m.p.h. at 20,000 feet and those without, a top speed guaranteed at 335 m.p.h. at 5,000 feet! The only plane that will be able to top these figures in the aforementioned contracts is the Lockheed interceptor which will do about 420 m.p.h. The North American and Martin bombers will in all accounts be larger than the Douglas with the possibility of more horsepower, but it is doubtful that they will be able to reach the speed of the Douglas, known as the DB-7G.

Now that Timm Aircraft has taken over Howard Hughes' record-breaking racer we hear that a re-designed version of it is in prospect with a 2000 hp. Allison engine to bid for Army Air Corps pursuit orders. Barkley-Grow, who has been selling some of their twin-engined transports lately, is also a prospective military plane builder . . . something on the order of a "flying cannon" will be the product.

Breaking all records for the smallest wingspread for six-cylinder Menasco-powered racers is Bob Beans' Tom Floyd racer. It measures 13' 6" in span and has an area of 44 sq. ft.! It is similar to the late Russell Chambers' airplane and was built in the same shop at the same time. The wing is of two-spar all-wood construction with a steel tubing fuselage and tail assembly. The left and right wing panels are one assembly and are set on top of the fuselage structure with a metal cowling fairing it into the fuselage. The wheels retract upwards into the side of the fuselage in Grumman fashion by means of a simple and unique arrangement that was also a feature on Chambers' ship. The bottom leg of the landing gear is hinged at the side of the fuselage and the other leg is attached to a sleeve that slides up and down a vertical tube in the center of the fuselage. A crank, located in the very minute pilot's cockpit, is geared to a sprocket chain that raises and lowers the sleeve, thus raising and lowering the landing gear. Adjustable tabs have been incorporated on the elevators. The elevators are attached to the control stick by means of a tube in place of a cable. On the large airplanes of today the engineers much prefer the use of flexible cable for engine and flying controls in place of rods as they have proved more efficient from a maintenance standpoint.

Flaps are employed on the racer, each about the area of the cover of MODEL AIRPLANE NEWS! If the plane flies and the engine turns up its required revolutions there is nothing in its class that could go any faster.

Art Chester's "Goon" and Tony LeVier's "Firecracker" have had slight changes made in design; as have the Menasco powered Wedell-Williams and "Miss Los Angeles." The Wedell-Williams has been rebuilt by Al Navotney, Curtiss-Wright instructor, and has a new engine up forward. The famous "Eightball" designed by Kieth Rider has had a new wing built on it by Story-Gawley who originally built the airplane.

John Hinchey, a Bendix Race pilot, is working on an airplane with its engine at the center of gravity with the propeller shaft running through the cockpit to the nose like the Bell interceptor.

Miss Jacqueline Cochran's Seversky racer was revamped at the Seversky plant prior to the start of the Bendix Air Race. Designated the AP-9, the airplane had a new center section installed incorporating a new landing gear that retracts inwards and flush with the bottom of the wing. It is the same as that used on the Seversky XP-41.

A Hamilton Standard Hydromatic propeller has also been installed, and with these new features, including changes in the engine, the speed of the airplane should be raised about 25 m.p.h. A small streamlined strut has been mounted horizontally on the right wing tip to steady the airflow at that point to prolong the stalling point.

Rearwin Aircraft & Engines, Inc., are busy designing a two-place trainer to be another one of hundreds now on paper looking for government orders. They also have a new single-engined, four-place sportplane in mind.

The Beech Aircraft Corporation has produced a new model, the 18S, with two important engineering features added. A new engine cowl has been designed around the 450 hp. Pratt & Whitney Wasp Jr. engines with the trailing edge flush with

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This Consistent Performer Will Solve Your Power Problem

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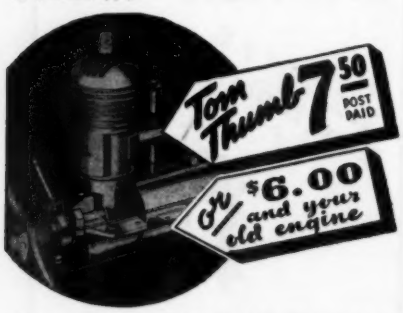

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the nacelles. Cooling flaps are located on the lower half of the cowl only. The tail has also been redesigned, and the company has the following to say about the results of these changes:

"The new cowlings increase the efficiency of the airplane considerably, and the new tail makes the single engine performance even more remarkable. At cruising speed one engine can be cut dead, and the pilot can leave his feet off the rudder pedals until the airplane slows down, without any pronounced tendency for the airplane to turn towards the dead engine! As the airplane slows down to its single engine cruising speed it will naturally turn towards the dead engine, but this can be remedied at the pilot's convenience by merely adjusting the trimming tabs after which the airplane will fly hands off on one engine! Figure eights can be done on one engine and there is no tendency for the airplane to dive in with the dead engine on the low side when turned in a steep bank.

"The Model 18S Beechcraft has a CAA approved ceiling on one engine of 12,300 feet. The CAA method of measurement involves climb to the ceiling on one engine from the ground up and is measured at the point where the airplane is still climbing 50 feet per minute. The army method of measuring single engine ceiling contemplates coming down to where the airplane can support itself on one engine, and with the army method the single engine ceiling will be much higher. The Beech has one of the highest single engine ceilings in the world for twin-engined airplanes and this is of course with full load."

A telescoping fairing is attached to the bottom of the elevator to fill the gap between the elevator and tail of fuselage when the elevator is raised. This feature of streamlining is also used on the new twin-engined Vega and North American NA-40 attack-bomber.

A very interesting little two-place, low-wing monoplane is that designed by Mr. John Thorpe and known as the Paulic XT3-B. It is the predecessor to the low-wing airplanes built at the Boeing School of Aeronautics which were also designed by Mr. Thorpe. The airplane is of all-metal design, including control surfaces powered by a 125 hp. Warner "Scarab" engine. The airplane was built by Mr. Paulic of United Airlines in his back yard for his own private use.

We print some statistics which we believe will prove of considerable interest:

The aviation section of the Signal Corps of the army was created on July 18, 1914, with 60 officers and 260 enlisted men. Later in that year the first Aero Squadron comprising 16 officers, 77 enlisted men and 8 airplanes, was organized at San Diego, Calif. This squadron later began operations with the Punitive Expedition in Mexico.

After America had entered the war in 1917 Congress appropriated $640,000,000 for army aviation; the largest appropriation Congress had made up to that time for a single purpose.

Flying schools were stablished at various points and ground schools were operated at a number of colleges and universities.

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Remember: when ordering be sure to state pitch, length and size of crankshaft on motor.

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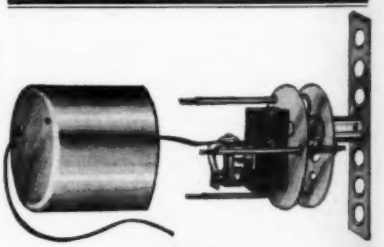

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Three volt—400 to 1 Gearing. Complete with Dust Cover and Lever Arm. 3½ oz., $4.00

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Nearly 15,000 flying cadets received training here and about 1800 in Europe. By March, 1918, our air corps strength was 11,000 officers and 120,000 enlisted men.

For production as a day fighter and bomber we adopted the British DeHavilland and the American Liberty engine—our outstanding aviation contribution—was installed therein. Contracts for 5,000 DeHavillands were let in September, 1917, and by May of the following year 155 of them had been delivered and 49 had been shipped overseas. At the signing of the Armistice, sufficient parts for 70 Handley-Page bombers were available for us in England and we were arranging for deals with the Italian Government for the manufacture of Caproni bombers in this country.

At the time of the Armistice we had 757 pilots, 481 observers, with 740 planes and 77 balloons at the front, and 1402 pilots, 759 airplanes and 252 balloon observers had entered the Zone of Advance.

Our aviators were credited with the destruction of 491 airplanes, of which 462 were accounted for by 63 aviators. We had 43 squadrons at the front when the peace was signed and of these less than 25 per cent were equipped with American built planes. All of which indicates without any reasonable preparedness it is a matter of several years before a nation can make itself felt in aviation in proper proportion to its wealth and strength.

The end of the war found aviation manufacturers in the U.S. proceeding at full speed. Airplane contracts were terminated as rapidly as possible but for several years it was necessary to utilize reconditioned war-time airplanes and engines. Naturally many aircraft firms were forced out of business. At this time the personnel strength of the air service was 18,000 officers and 135,000 men.

Such was the frenzied progress made in American military aviation during the war.

The Physics of the Airplane

(Continued from page 32)

of the material tends to decrease. An important case which has had extensive application in the field of aeronautics concerns the flow of liquids through pipes in which constrictions exist. Let us analyze this phenomenon carefully.

Assume that the cross section of a section of circular pipe changes abruptly to a smaller diameter at certain designated points. Should a fluid be flowing through this section of the pipe, the velocity of the fluid must be greater at the point of reduced diameter in order that the average flow through each cross section of the entire length of the pipe may be the same. We may then say that the momentum of the fluid is greater at the point of reduced diameter than at any other point along the entire length of the pipe where the diameter has an increased value. It then follows, that an increase in the momentum of the fluid has been effected due to its flowing from the larger to the reduced section of the pipe. In accordance with Newton's Second Law of Motion, a definite force is required to produce a change of momentum. In our case, this force is represented by the difference in pressure

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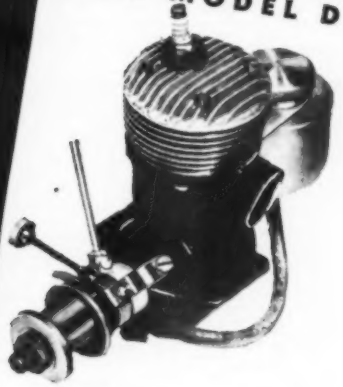

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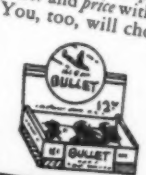

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of the fluid at either side of the point of the restricted diameter of the pipe. Hence, the pressure at the section of the enlarged diameter will be greater than that existing at the section of the reduced diameter so that the difference of pressure will be positive and in the direction from the larger to the smaller section. In this manner a positive acceleration is produced in the fluid. The converse of the above principle becomes true in the case of fluid flow from a smaller to a larger section of pipe, the velocity of the fluid becoming smaller at the point of enlargement of the section, while the pressure at this point becomes materially increased. When the point of restricted diameter is approached gradually, thus attaining the form of a smoothly tapered throat, the circular pipe is designated as a "Venturi Tube." Occasionally, the extremities of venturi tubes employed for aircraft purposes are flared out into elliptical cross sections in order to provide increased area.

The choke tube of the standard form of engine carburetor assumes the form of a venturi tube. The liquid fuel is forced under pressure to a central nozzle or jet located below the throat, or the point of restricted diameter, of the choke tube. Atmospheric air is drawn into the choke tube, either under the suction of the engine pistons going downward on the intake stroke or under the positive pressure of a supercharger impeller. Upon approaching the throat, the velocity of the incoming air is increased in the manner treated above. The resulting blast of air rips the droplets of carbureted fuel from the tip of the central nozzle or jet and whirls them into the induction pipes above the choke tube where they are vaporized into a gaseous state or volatile state with this entering air.

Another widely employed form of the venturi tube incorporates the suction characteristic attainable with this device as an actuating medium for the operation of aircraft instruments. The Venturi-Pitot air-speed tube represents a device of this type. The trumpet-shaped venturi tube is fitted with a side tube leading out from the narrowest section of the throat. As the forward speed of the airplane to which the device is fitted increases, the venturi produces a pressure lower than atmospheric air, or in other words, a suction. Calibration of the instrument is based upon the fact that the amount of suction varies as the square of the air speed. A Pitot tube registering dynamic pressure, caused by the impact of the air, is also incorporated into the engine and so designed that the magnitude of the suction is approximately four times the pressure of the Pitot. By combining the venturi and the pitot into one pressure tube, a pressure differential which is, roughly, five times as great as that attainable with the pitot alone is obtained, thus making it possible to employ a more rugged instrument for the air-speed indicator. The speed of the involved airplane is obtained through the use of a suitable conversion factor employed in conjunction with the recorded pressure in inches of water. The Venturi-Pitot air-speed tube is illustrated in Figure 3. The venturi suction tube has also been employed to actuate the gyrostatic tube of the turn indicator. In this application, the venturi functions primarily in the same manner as described above. Recently the use of the venturi as an actuating medium for the operation of navigation instruments on the larger airplanes has been somewhat discouraged due to the danger of formation of ice and other foreign materials at the mouth of the tube. Such congestions will tend, of course, to prevent further functioning of the device. In the case of icing condition, heating elements were inserted into the mouth of the venturi, being fed from the airplane's electrical system. This, however, in practice has not been wholly satisfactory in view of the fact that condensed moisture worked up into the instrument cases and minimized their effectiveness. Current practice entails the use of engine-driven vacuum pumps as a suitable substitute from the venturi tube in the previously mentioned application. The standard form of wind tunnel, so extensively employed for the determination of aerodynamic characteristics, represents another form of venturi tube.

The general principle underlying the relation between pressure and speed in a moving fluid is known in the world of science as Bernoulli's Theorem. This law states that, as we inferred above, with an increase in velocity, the pressure drops, and with an increase in pressure there exists a corresponding decrease in the velocity of the involved fluid. We know that air can be considered as a fluid. Considering the fact that the lift of an airplane is derived almost entirely from its wings, we may quite accurately assume that an airfoil, or wing, is composed of many elementary venturi sections. Then, in accordance with Bernoulli's Theorem, a velocity increase occurs with a corresponding decrease in pressure on the upper cambered surface of the airfoil. Similarly with a constant pressure or a pressure increase with a corresponding velocity decrease on the lower cambered surface of the airfoil, the airplane will be lifted upward.

From the foregoing explanation, we can see that the generation of airfoil lift is, in reality, the resultant of the design of cambered or convex surfaces of wing profiles which tend to exhibit flow characteristics which result in a lift force. The problem then boils down to determining a cross section which shows a great decrease in the negative or low pressure on the upper surface compared to the positive pressure generated by the lower surface. The greater the difference between the two pressures, the greater the lift, approximately speaking. The aerodynamic problem which makes this seemingly simple design problem complex, is to determine profiles which do not exhibit wide variation of the center of pressure or lift with a change in the forward velocity of the airfoil through the air. This treatment of the flow of air over airfoils is known as "aerodynamics." Similarly, the treatment of the flow of fluids about bodies immersed in a fluid medium is known as "hydrodynamics."

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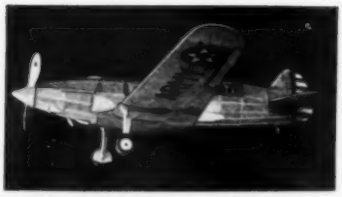

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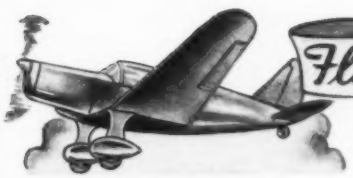

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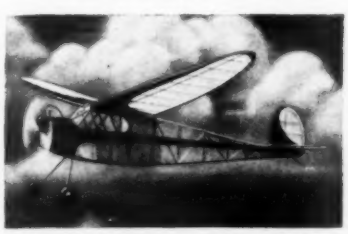

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